MOTOR AGE

Vol. XXXIII
No. 3

CHICAGO, JANUARY 17, 1918

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Mends Leaky Radiators

No Tools Required

JOHNSON'S RADIATOR CEMENT

A NEW and efficient way of mending leaky radiators is with Johnson's Radiator Cement. It is quicker more economical and more satisfactory than any other method.

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MOTOR AGE

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Vol. XXXIII Chicago, January 17, 1918 No. 3

Contents

NEXT WEEK

The next issue of Motor Age will be the annual Chicago show number, in which will be presented for the benefit of the motorists a complete resume of the devices for the motor cars. This will be in addition to other features which will consist of articles of special interest to Motor Age readers.

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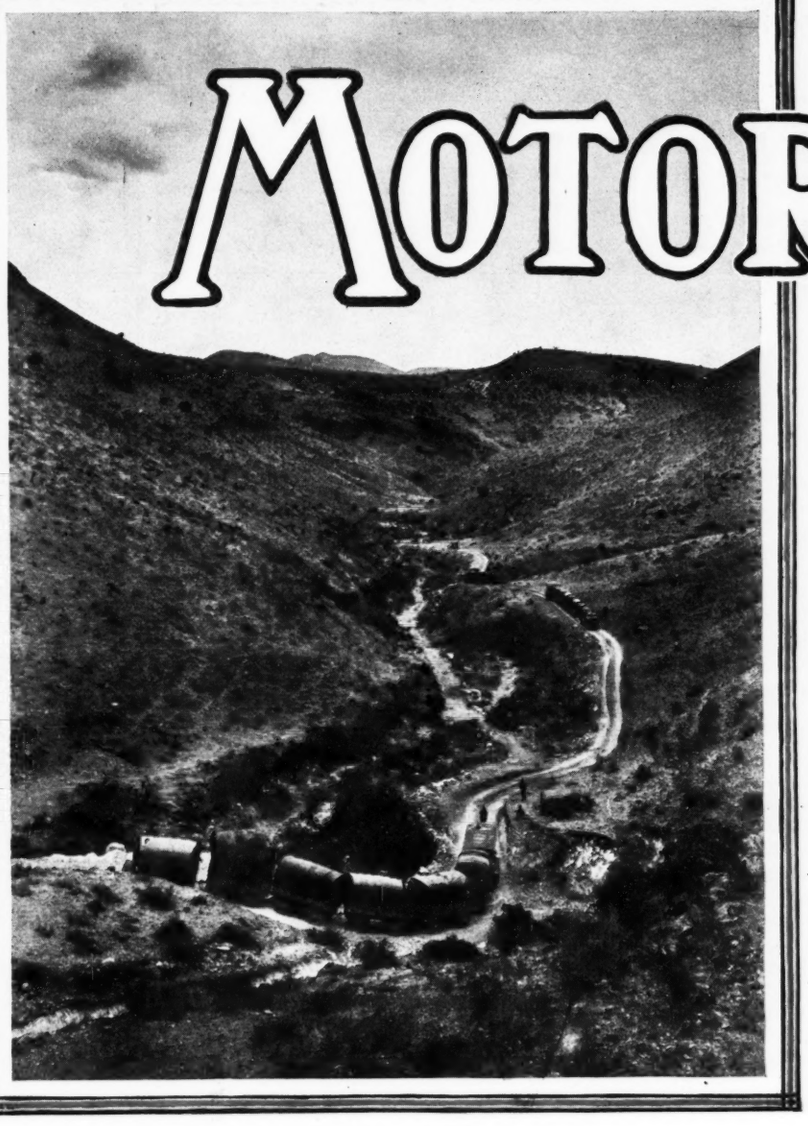
MOTOR AGE

Testing Trucks for Uncle Sam

By George J. Kavanaugh



Caterpillar tractor train No 1, Q. M. C., in Pinto canyon

DOWN in the Big Bend district, better known to those down there as No Man's Land, is Uncle Sam's battlefront. The main base is Marfa, Tex.; the line of action is from 60 to 75 miles down on the Rio Grande. There an army protects the border for some 200 miles and has for sub-supply stations the river towns of Polvo, Presidio, Indio, Ruidosa and Candelaria. The greatest problem to solve is keeping the troops supplied with food and munitions from the main base at Marfa. To do this the Government has found that the transportation of supplies must first be across the plains, then over hills, through deserts of sand, into deep canyons, up over the mountain trails to the Great Divide and then down into the river bottoms to reach the sub-base.

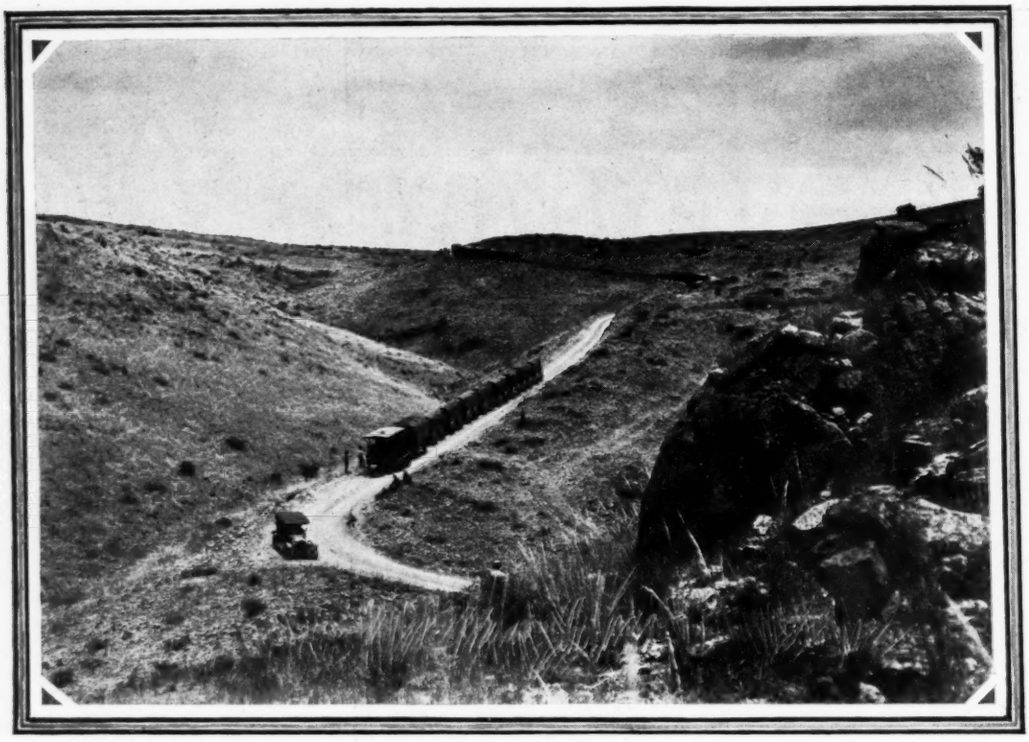
"What has all this to do with the world war?" you ask. Just this. To beat the Hun in Europe Uncle Sam's millions of soldiers will require thousands of truck and tractor trains to keep them supplied. Engineers of the motor car and truck industry throughout the United States have been battling with the problem of transportation for Uncle Sam since the war became an integral part of our life over here. First, it must be understood that right at home, you might say, right within our own borders, we have a campaign to protect our boundary line on the south and in this the Government has found all the elements that have to be solved on the battlefields of Europe in the transportation of munitions and food for man and horse.

Because of this situation the Government has chosen this lower Rio Grande country as a testing ground where the product of the brains of a multitude of engineers and designers—engines of war represented by military trucks and tractors—can be tried out and their efficiency for real war work determined. Almost all the obstacles to truck and tractor travel that exist, or could be imagined, are found in abundance on all the roads leading out of Marfa to the sub-bases. Something of each base will be told, characteristics that will fix them in your mind.

Marfa is the gateway to the Big Bend district and is a city of a thousand souls; perhaps slightly less. Here is stationed Truck Train No. 11, under the command of Capt. Bennett Bronson, formerly a manufacturer of metal goods at Waterbury, Conn., assisted by Capt. Bradford Brinton, who made plows at Dixon, Ill., before the war. These two officers were sent down to Marfa to solve the trasportation problem and select for the Government the motor trucks and tractors best suited for the job on the western front in Europe.

As the word picture of these various trips between Marfa and the sub-bases is unfolded for you, remember to temper your impression with 115-deg. sun and a Texas sun, too.

We left Marfa with two trucks entered for test. On each truck the driver was an enlisted man with the rank of sergeant. The driver of the truck on which I rode had been nicknamed the Chinaman, but later I found he was a three-quarter blood Cherokee Indian—a 6-footer with a pair of arms developed by three years of service up and down the border and with General Pershing into Mexico. Arms such as his were necessary I found before we reached our destination, for driving loaded trucks here is no job for a weakling. This sergeant is one of a specially detailed



A glimpse of Pinto canyon road on which tests are made

squadron of drivers for testing trucks. These men do nothing but drive in the tests and report to Captain Brinton, the test officer. Efforts to get information out of this driver availed nothing; one might as well have talked to an iron post.

The first 25 miles is over plains and through a hilly country; the next 10 miles through the foothills of the Shafter mountains. Here we began to strike the rough country. The road seemed to be covered with boulders, yet the Indian driver effectively dodged every rock of any size, though just how he managed to do it I must confess I don't know. Slowly we wound our way up grades ranging all the way up to 40 per cent, then down into a canyon and across a dry creek bed, called an arroyo. Immediately we began climbing again. Up, up we climbed until we were well into the mountains, then a winding descent through another canyon and we came out on the far side of the divide.

Down at Shafter

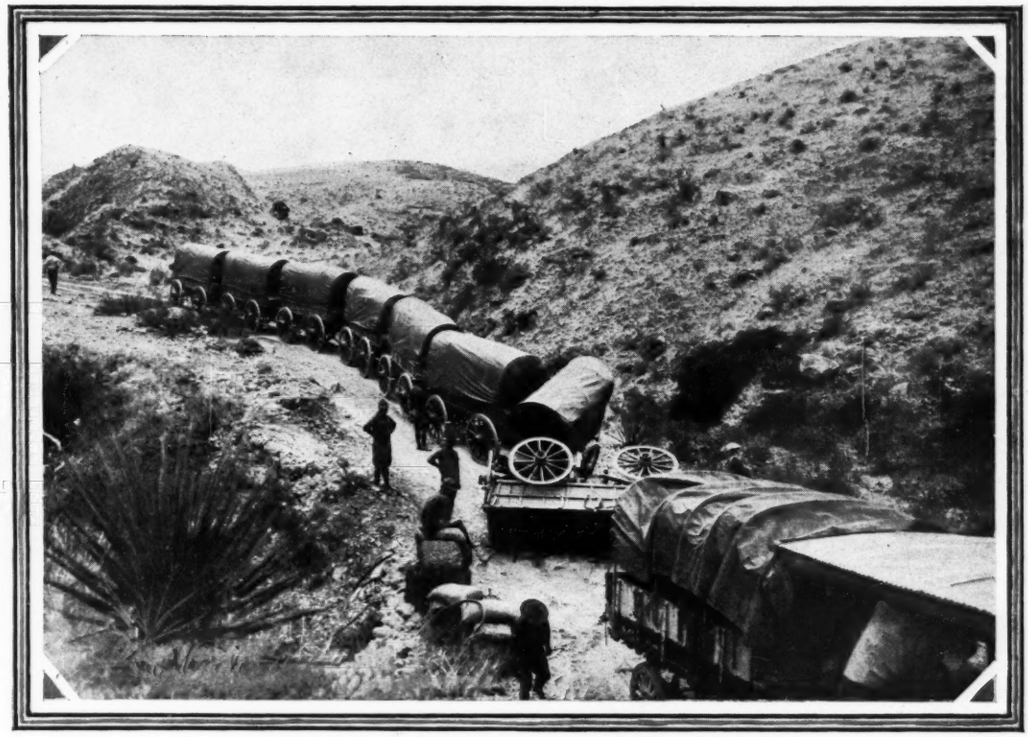
Down in a veritable bowl, surrounded by high peaks of the Shafter mountains, lies the mining village bearing the same name as the crags that tower above it. Here is the Presidio Mining Co., one of the largest and richest silver mines in the world. Looking down we could see the traveling bucket cable train, carrying the ore to the big red smelter, surrounded by hundreds of white adobe huts, the homes of the miners. Down the mountain side and around what is called Rattlesnake trail we wound our way into the little mining village. Here the engines were inspected and supplies of gasoline, water and oil replenished. We now were 45 miles from Marfa.

The sergeant gave the order to climb on and once more we started, this time to get up out of the bowl that surrounds Shafter. The climb was much the same as we had just made before coming down into Shafter. At the top of a zig-zag trail we could see in the blue-haze, really not more than 18 miles distant, although it seemed much farther, the silver line of the Rio Grande loafing along on its way to the gulf, and also the mountains over in old Mexico. If the "seeing" was difficult the driving there was worse. It looked to me like an easy trip, but I found many more arroyos, and stretches of treacherous "zip" sand, as fine as powdered chalk, lay in our path. The wheels sank down to the hubs, but the engine of our truck delivered the power through a four-speed gearset and took us through, although much credit is due my Indian driver, for I doubt if any man but one experienced in this kind of driving would have made it without the maximum of difficulty.

Arroyos and more arroyos. It seemed more like arroyos with an occasional stretch of road. Ultimately we came into an open space and at a glance we saw Presidio. I say at a glance, for one glance is sufficient to include the scant dozen adobe shacks that make up the rather euphonious name of the village. Two troops of the Eighth Cavalry are stationed here. Presidio is supposed to be a port of entry, therefore there is a customs officer on duty. Across the river is the Mexican town of Ojinaga, with its Carranzista general, Ramirez, and several hundred Mexican soldiers.

These two towns—Presidio on the Amer-

A motor truck train camp at Marfa, Tex., from which radiate the

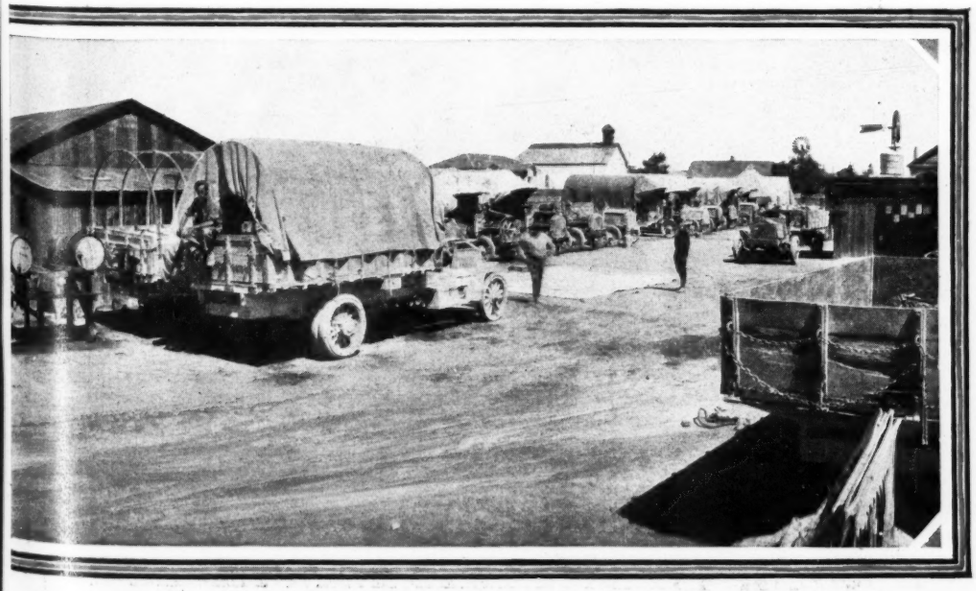


A bad spill while a motor train is passing through a canyon

ican side and Ojinaga on the Mexican side have made history in the last three years. Ojinaga has been the scene of many Mexican battles. The town has been captured several times by the Carranzistas, and as many times recaptured by the Villistas. Like some of the towns in our Civil war, this little Mexican hamlet was kicked about so much that one never knew from one day to the next who would have control. In the early stages of the Mexican trouble Ojinaga was the goal for several thousand rich Chihuahua merchants, together with General Diaz' commanding generals, who made an overland trip across the deserts from Chihuahua City, carrying several million dollars in gold bullion. Almost simultaneously with the arrival of these merchants and a part of the Diaz army, Villa and his army arrived. The border bandit had tried to intercept the rich caravan and turn the gold to his own advantage. In a battle which lasted several days the Diaz troops were defeated and retreated across the river to Presidio. Today the Carranzistas are in command; tomorrow perhaps the Villistas will control —that is why Uncle Sam keeps a heavy guard on this port of entry, 63 miles from Marfa.

The trucks were unloaded and we started back over the same road, arriving in Marfa in time for mess call. With a sunburned face, and shaken up a bit, I finished my first trip over one of the toughest test roads for trucks there is in the United States.

Ruidosa is 54 miles from the Marfa base. Leaving Marfa, we traveled over the Presidio road for 4 miles, then struck off to the Southwest, following the trail over the plains for 31 miles, and this road has its many rough spots. We passed several of the new tractor trains. The first was a Holt 50-hp. caterpillar and was pulling a long line of trailers loaded with hay and oats. It was making 2 m.p.h. On each trailer was an enlisted soldier to handle the brake. A few miles farther we came upon an Avery tractor with its long line of trailers, slowly winding its way across the dry river beds.

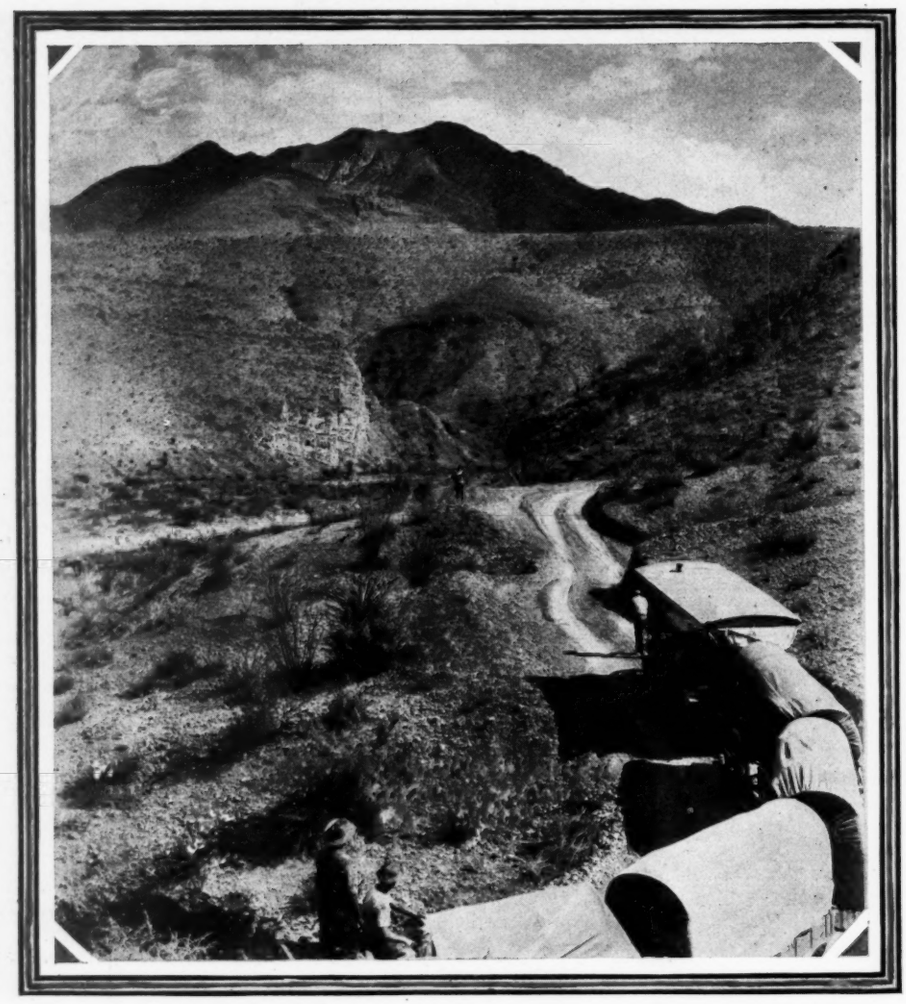


roads to the sub-bases enroute to which trucks and tractors are tested

Marfa to Ruidosa

Abruptly we came to the entrance of Pinto canyon, the road dipping more than a thousand feet into the canyon. In this drop the road crosses and recrosses Davis creek several times. Here is a wonderful scenery, but one thinks more of the possible result of a drop to the bottom of the 1000-ft. chasm than he does the grandeur. The drivers are hardened, but I was not. This is the type of road that seems in no hurry to get anywhere. It winds about between massive boulders, many of which seem ready to topple over on traffic. Some of the way the roadway is hewn out of a perpendicular wall of rock, walls so smooth and straight that nothing but a fly could stick to them. We are gradually dropping and eventually reach the bottom of Pinto canyon, immediately to begin another climb to what is known as rim rock. From here we saw, nestling far below on the river bank, an army camp of two troops of cavalry.

The tents of the teepee class, set in a square, and in the center a large pole with the Stars and Stripes flowing gently in the



This motor train is approaching a difficult turn in Pinto canyon

breeze, the silver strand of the river winding through the camp and away in the distance; it was a sight to thrill at times less poignant than these in our history, but especially so now. Across the river a few adobe shacks make up a Mexican camp, not Carranzista or Villista, but an independent Mexican outfit under the command of a bandit known as General Chico Cano with 400 well-armed bandits. This band fears neither Carranzistas or Villistas. Cano places no favors on either side and he fights anybody. He keeps his eye on the American camp across the river, for they are the only ones he fears. If it were not for this camp he would have rich prey on the American side of the Rio Grande at this point. Cano and his band are the reason for our having troops at this point on the border.

Marfa to Indio

Unloading our 2 tons of oats, we started once more for Marfa. Twenty miles out on our return trip we came upon the Phoenix Centipede, a 50-hp. motive apparatus, battling away, making 2 m.p.h., and hauling some 30 tons of forage for the horses at the Ruidosa camp. The sight of one of these gasoline freight trains, rolling along through this wild country, is well worth a trip from an eastern city.

To get to Indio we traveled the same road that goes to Shafter but turned off the Presidio road there and kept to the south along the sides of the Shafter mountains on to a mesa, then down through deep arroyos, while a final 20-mile climb over the worst rocks I ever saw in a roadway—I was told it was the rockiest in all Texas—into Indio. Here another body of Uncle Sam's troop watches bands, of Carranzistas to-day and Villistas to-morrow, across the river.

Indio is desolate. Not a green patch in sight, even to the very edge of the Rio Grande. Not a place to linger if one would. Because there is a Mexican village across the Rio Grande here, our soldiers must stay on guard. To me solitary confinement would be welcome to here.

We dumped our load and began our return trip to Marfa, nor was I sorry. Not even a burro or pack train did we meet. At Shafter we took on water, gas and oil and while we were waiting the Indian driver called my attention to a swirl of dust far up the mountainside. Out of this dust emerged the first truck of the Packard train, then another and another, some twenty in all. Down the side of the mountain, around the rim rock, through the deep cuts we saw the cloud of dust and we know that somewhere within this haze was a truck convoy. I turned to the Indian driver and said:

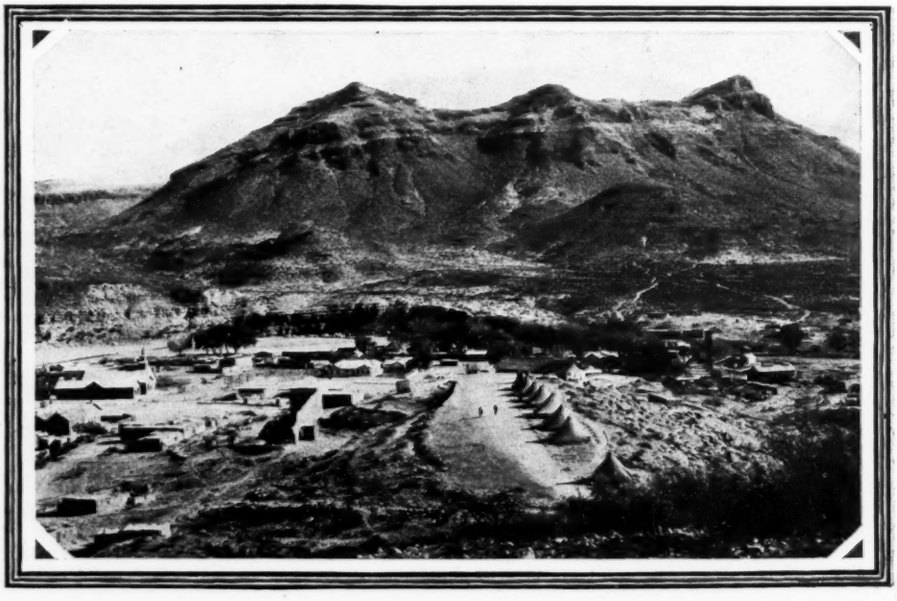
"They're certainly going some!"

"Yes, they're 'ballin' the jack,'" he smiled, then added: "We will have to wait until they get down, for no two trucks can pass on that trail."

Dust Over All

Thirty minutes later, with a roar, the truck train entered the town. The drivers, wearing skull caps and large glass goggles, were covered with a coat of gray dust. Cool mountain water slaked the thirst of man and iron horse.

Once more we hit the trail. Three miles from Marfa and mess call, we met another invention in the tractor line—a Lombard with a 100-hp. Wisconsin marine engine. This tractor has the lines of a twentieth century electric locomotive—one of those that takes you under the Hudson river into the heart of New York. Its train, composed of five trailers, each loaded to the capacity of 5 tons, rolls over any old country at a speed of 7½ m.p.h. No matter if it is river bottoms or the top of the Great Divide, the Lombard goes through, its performance giving one the



Down in a bowl is Shafter, half way on Presidio road

thrill of amazement. Even my Indian driver, who is used to all kinds of freak apparatus being tested out down in this country, stopped our truck, and we both watched it as it passed. He made some remarks, which, if given, might be misconstrued as boosting, which is not the intention of this story, so we will not repeat them.

I had heard much talk of the coming Polvo party, as Captain Brinton termed it, and looked forward to this trip with much interest. For this run several of the trucks at Marfa for test were to be combined into one train, or convoy. I had been told that this was the hardest of any of the five trails to as many sub-bases out of Marfa. It was no 73 miles of promise from Marfa to Polvo and no matter how badly anyone spoke of this road his comments would be mild compared with what it actually is.

Marfa to Polvo

The Polvo party started early in the morning, the train being made up of four trucks. In the lead was a Master, four-speed, built according to Uncle Sam's specifications for military service, next a standard Master built for commercial purposes—both 2-tonners—third a Denby, 1½-ton, four-speed, a three-speed Burford being fourth.

The train left Marfa and set out over the plains toward Shafter for 8 miles, then south over the Polvo trail—miles and miles of rough rocky road and dry river beds. I rode on the first truck, the Indian at the wheel. Presently a Dodge Brothers roadster overtook us, carrying Captain Brinton, who changed places with the Indian driver, the latter taking charge of the roadster. Captain Brinton gave orders to proceed.

My curiosity was aroused to know why the captain so unceremoniously appeared on the scene and took the wheel of the truck in the lead. The Indian told me Captain Brinton was watching and knew just when to take charge of a truck under test to determine its performance under certain conditions. Captain Brinton knew the road and what to expect. He tried every truck at some time during the trip.

At Alamito Creek the Indian waited for the rest of the party to arrive. "Here is where the fun begins," he smiled and I found out later what he meant. Captain Brinton surveyed the train as it lined up and ordered the Indian driver to take the lead in crossing a dry river bed that looked none too solid for truck hauling. Releasing his brake and shifting to low, the Indian moved the Master four-speed along to the river bank, then over, dropping to the lower level. Slowly the wheels sank into the gravel, but as the power was applied, the Master plowed its way 100 ft., then up over a little rise, once more into sand and gravel. It fought hard but never wavered, crawling up the farther bank none the worse for its experience. Next came the second Master. Down the embankment, into the gravel it plunged. Slowly the wheels sank, the driver battled a few feet in low, giving her all the gas she would take, but the power was not there and she stuck.

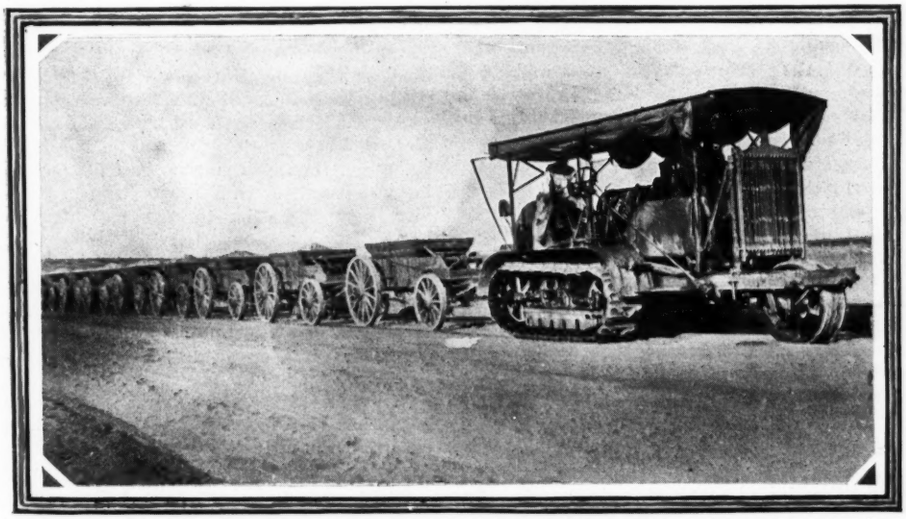
A stop at Shafter for oil and gasoline for trucks from Marfa, below, and Master four-speed truck in Shafter mountains

All Hands Out

"All hands to the wheels;" shouted Captain Brinton. "Now, driver, give her all the gas you've got," and with the assistance of many men with brawn and muscle progress was made, but slowly.

Next the Denby came forward, emulated the second Master, and many hands aiding in wheel turning brought it to the farther side of the river. The Bedford performance was the same. Thus the four trucks crossed one of the most dangerous spots on the entire road.

"Captain, don't you think that this



Feed for the army horse is being hauled by tractors

river crossing could be improved by engineers?'' I asked.

He laughed and said: ''It does not rain very often in Texas, but when it does the Mississippi hasn't got anything on Alamito creek. See those big holes over there? Well, it took us three weeks to dig a tractor and a string of trailers out of there. They got caught crossing this creek 10 min. before a rain.''

The next stop was Alamo ranch. Here we found wonderful spring water oozing out from the side of a hill that had a solid rock formation, and here the captain bid all drivers look to their water supply. While this was being done he listened intently to each engine to see if they were functioning properly. Our next objective was Casa Piedras, taking us through the Devil's Out. As we started up the climb, named for the keeper of Hades, the captain stood at the top for the verdict in each truck's performance. Over went the Master four-speed. Next came the standard commercial Master. It nearly made it but stalled near the top. Block and tackle with the first Master brought the second over. It was the same with the Denby and the Burford. After each truck came over the captain made a note in his book.

All during the day the train of four trucks battled through canyons, arroyos and river beds, reaching the Polvo base at night. The party was tired and worn out after the day's hard struggle. The soldiers' camp here seldom sees a truck train, as their supplies usually are packed in from Presidio down the river bank. Nothing but trucks under test come in, and very infrequently then.

The truck train crew after unloading appeased voracious appetites at the mess kitchen. Wrapped in blankets, some in empty trucks, some on the seats, some out on the ground, they fell asleep to the music of a pack of coyotes up on the rim rock a mile or two away. The next morning I awoke and found we were again on the bank of the Rio Grande, while in all directions for several miles were fields of maize with here and there an adobe hut of the Mexican farmers. Across the river is the village of Mulatto, named for the Mulatto mountains, which stretch far south into that great, mysterious, blood-stained Mexico. After breakfast of coffee, bacon and hard tack, we started on our homeward trip to Marfa. All day long the same struggle with river beds, arroyos and steep mountain grades. Sunset found us 10 miles from Marfa. A tractor train pulled to the side of the road to give us right-of-way. Over to the right of the road, half a mile away, were thousands of sheep grazing among the rocks. Standing among them was a Mexican peon sheep herder in his rags and weather-beaten sombrero. He watched the rolling monsters—trucks and tractors—and wondered the why of it all.

JORDAN SALES INCREASE

Cleveland, Ohio, Jan. 11—During the quarter ending the first, the Jordan Motor Car Co. sold 30 per cent more cars than in the same period a year ago. The net profit represents 16.7 per cent on the $300,000 worth of preferred capital for this quarter, which is at the rate of 66.8 per cent for the year.

News from the Capital

Completion of First Five Machine-Made Class B War Trucks Marks Events

President Wilson Prohibits Aircraft Exhibits During War

WASHINGTON, Jan. 14—Special telegram—Although many temporary residents of Washington left here last week for the New York show, several important events of interest took place. Important and significant is announcement of the completion of the first five machine-made Liberty trucks, class B, by the Gramm-Bernstein, Lima, Ohio; Sterling Motor Truck Co., Milwaukee, Wis.; and Republic Motor Truck Co., Alma, Mich., designed on schedule and made on schedule, and tested on schedule. These war trucks provide wonderful proof of the stability and efficiency of the industry.

Very interesting was the arrival here Saturday of the largest and longest motor truck transport ever driven in America, the forty-six motor trucks and passenger cars which were driven from Buffalo to Washington in ten days, a remarkable record in view of the weather and road conditions.

Owing to the danger of communicating to the enemy our present status of aircraft invention President Wilson has issued an order prohibiting further exhibit of aircraft in the United States or its possessions during the war.

That mysterious virgin energy Garabed today received approval by the Senate committee on patents, which authorized the Secretary of the Interior to accept, as trustee for the United States, an assignment of the right to utilize for the Government the discovery claimed by Garabed T. K. Kiragossian. The resolution also provides for the demonstration of this invention before five eminent scientists.

All industries not essential to war are to be temporarily curtailed soon by Fuel Administrator Garfield. He will make an official statement tomorrow. Dr. Garfield's order, it is reported, will not completely shut down non-essential industries but will limit them to three days a week and be a temporary measure to relieve the coal shortage. Dr. Garfield told the Washington representative of MOTOR AGE that he considered the motor car industry in the non-essential classification.

The secretary of munitions' position in the Cabinet suggested by a bill by Senator Chamberlain will not materialize if signals are read correctly. It is reported neither President Wilson nor Secretary Baker favors creation of the new position, which would revolutionize all pnases of handling of trucks, tractors, airplanes and other war supplies.

Truck makers and manufacturers of passenger cars and tractors with business connections in Russia will be relieved to learn that the United States expects soon to give informal recognition to the Bolsheviki government, provided it does not conclude peace with Germany. Such recognition would smooth the paths of delivery and collection for manufacturers exporting to Russia.

The daylight saving bill passed the last session of the Senate but refused by the House comes up again this week. It is favored by the President and Secretary of Commerce Redfield and probably will be passed by Congress this time.

Mark L. Requa of Oakland, Cal., is the head of the newly formed oil division, and his first work will be to investigate the petroleum situation. The Fuel Administration, it is understood, has not decided how far it will go in controlling the supply of oil. The control bill, though it does not give authority to fix oil prices outright, empowers the Government to institute a licensing system. It is considered likely that the subject of how far control will be carried will be left largely in the hands of Mr. Riqua, who is a mining engineer and an oil expert.

N. A. D. A. PLANS WAR WORK

New York, Jan. 11—The board of directors of the National Automobile Dealers' Association met to-day and began plans for the entry of the organization into co-operation with the Government. The first step will be the naming of a war service committee to assist in the elimination of waste and inefficiency in business as a measure of co-operation with the Chamber of Commerce of the United States and the Commercial Economy Board of the Council of National Defense.

The committee will consist of ten members, six of whom are already selected. This committee will organize in about two weeks and begin the formation of suggestions for improving business along the new lines.

FIRST U. S. AIR GRADUATES

Washington, Jan. 12—The first group of completely trained American Aviators ready for service has been graduated by the air school nearest the front line in France. The men have completed the final courses in aerial photography and observation. All but one received commissions.

CHICAGO DINNER IN SPOTLIGHT

New York, Jan. 14—The war dinner of the Society of Automotive Engineers scheduled for the New Morrison Hotel, Chicago, Friday, Feb. 3, as a climax to the special tractor meeting of the society to be held on that day has now come into the spotlight since the New York meeting and dinner has become a matter of history. The Chicago war dinner promises to be the greatest in the society's history. It will provide comfortable seating for 1500 diners, and already approximately 1000 seats have been sold. The special program connected with the dinner should stamp the event as perhaps the greatest war dinner of its kind held in Chicago.

To carry out the war spirit a $25,000 pipe organ has been installed in the hotel dining room for the occasion. In addition to this music will be furnished by an orchestra of thirty pieces, and there will be fifty voices from the Apollo Club, one of the largest musical organizations of the Windy City.

Only war music will be sung, and a special program of it has been drafted and rehearsal started last week. The entire work of the program is being handled by the Mid-West Section, and B. B. Ayers of the section has the program in direct charge.

The tractor professional session will start at 1:30 on the afternoon of Friday, Feb. 1, and will be held in the crystal room of Hotel Sherman. The program, already announced, deals with the engineering under such heads as fundamentals of general tractor design, fundamentals of transmission systems in tractors, fundamentals of engine design and tractor service. Opportunity for discussing these different subjects will be afforded at the meeting.

TO CO-ORDINATE TRUCK BUYING

Washington, Jan. 11—Major-General George W. Goethals of the Quartermaster Corps has been appointed to serve also as director of War Department transportation. This means a co-ordination and co-operation of motor truck design and production and insures economy in the use of them and in their maintenance. In the past the Ordnance, Engineers, Signal Corps, Aviation Service and Coast Artillery have been purchasing trucks, tractors and other motor vehicles individually. In the future all of these will co-ordinate their demands and facilities.

TRUCKS TO HELP SELL FOOD

Grand Rapids, Mich., Jan. 11—In accordance with the plan of the Postoffice Department, the city postmaster is advertising for bids on a postal truck route to be established between this city and neighboring cities. The first route will connect Grand Rapids with Saginaw, a distance of 123 miles, and a trip will be made each way six days in the week. As is the plan in other cities this truck will carry out the detail functions of the traveling postoffice and carry produce from the farmer direct to the consumer.

BIGSBY TO AID COMMITTEE

Washington, Jan. 11—G. L. Bigsby, engineer for the Anderson Electric Co., has been lent to the Automobile Industries Committee and will serve on the corps of engineers now employed by the committee for investigation of motor car and parts factories.

500 AT M. & A. M. A. BANQUET

New York, Jan. 11—The fourteenth annual banquet of the Motor & Accessory Manufacturers' Association held at the Waldorf tonight was attended by over 500 members of the association and guests. After an address of welcome by President Charles W. Stiger, a combined dinner, vaudeville performance, war lecture, and war movie show took place and continued until 1:30 a. m. The war talk by Corp. R. Derby Holmes of Boston, and late of an English regiment, was one of the most interesting war talks of the season. This was followed by five reels of Italian war film showing the Italian army fighting in the region of snows and ice, and also the work of the Italian motorboat submarine chasers, dirigibles and airplanes.

Vanderlip to Rubber Men

Addresses Association of America During Show Week in New York

Emphasizes Policies on Economy Before Expounded

NEW YORK, Jan. 11—Frank A. Vanderlip of the National City Bank, who is now operating for the Government the war thrift stamp loan campaign, addressed the Rubber Association of America at the Waldorf-Astoria this week and reiterated those policies which he has been mentioned before as expounding.

Mr. Vanderlip maintained that the individual in our nation should be more economical and that he should not spend money. He maintains that if we are to win the war we must cease to buy many of the things we have purchased in other years; that we must cease to buy what he termed luxuries, and he is credited with having indicated earlier in the day that the motor car was non-essential. The car, by the way, has long since ceased to be classed by our Government as a non-essential.

Mr. Vanderlip talked of the need for greater factory capacity, but he did not point out any particular use that would be made of factory capacities if all the factories in America offered themselves to the Government to-morrow. He talked of the need for releasing labor for Government work, but he did not point out where men are needed, what they are needed for or anything of that kind.

He is also credited with having stated previously that if a man's old hat will last six months longer he should not buy a new hat until six months from to-day. He said some people fear that we may disorganize business. He said: "The tragedy of it is going to be that we are not going to disorganize certain kinds of business enough. In the period of such tremendous prosperity, in a time when the wage fund is so great, when the profits of agriculture are so tremendous, it is going to be impossible to take this lesson of economy with 100 per cent efficiency to 100,000,000 people. What I fear is that we shall have the greatest business in luxuries we have ever known, that people will unconsciously exercise their command over labor, over material, over shop room and transportation, and will interfere with outfitting this army."

He said the Government had appropriated $19,000,000,000 for the purchase of raw materials and had been unable to spend this money because there were not enough things produced to spend it for. He did not agree with the policy that we must expand our industries to promote greater production, but indicated that we must cease some of our production in order to make room for war work, which is contrary to the idea of the expansion of industry that is now recognized by most of our readers as the only sound course to follow.

U. S. Woman Drivers

Washington, Jan. 11—The depot quartermaster of the War Department has asked the Civil Service Commission to provide a list of women eligible to drive motor trucks. The Department will use 100 women motor truck drivers on the streets of Washington at $70 a month to start. None of the drivers will be sent abroad.

CASE GETS NEW ORDERS

Racine, Wis., Jan. 12—The J. I. Case Threshing Machine Co., Racine, Wis., has received an order from the French government for 2000 gas-oil tractors with three-bottom plows and began deliveries during the week. The 2000 machines are of the 10-20 type and with plows will require from 600 to 700 railroad cars for transportation to tidewater. Many tractors of a heavier and more powerful type also will be built for France. The Case company recently shipped a large order for tractors and separators to Italy.

NEW DIVISION FOR LABOR

Washington, Jan. 11—The Department of Labor has organized a new bureau called the United States employment service which is an enlargement of the previous immigration service and includes the two auxiliary bodies, the United States Public Service Reserve and the United States Boys' Working Reserve. It is planned to get the mechanics needed in the shipbuilding industry through this new bureau. J. B. Densmore has been appointed national director and will be assisted by Robert Watson and Charles Clayton.

NO G. M.-CHEVROLET MERGER

New York, Jan. 11—Plans for merging the Chevrolet and General Motors companies again were pigeon-holed after a joint directors' meeting here this week. It possibly is due to General Motors' war business in trucks, shells and Liberty airplane engines, said to total $60,000,000 during 1918, that the deal did not go through.

M. & A. M. A. RE-ELECTS-OFFICERS

New York, Jan. 11—The Motor & Accessory Manufacturers' Association today held its annual meeting and re-elected four retiring directors: Christian Girl, Standard Parts Co., Cleveland; E. H. Broadwell, Fisk Rubber Co., Chicopee Falls, Mass.; E. W. Beach, Manufacturers' Foundry Co., Waterbury, Conn.; L. M. Wainwright, Diamond Chain & Mfg. Co.

All of the officers of the association except the secretary were re-elected as follows: President, C. W. Stiger, Stromberg Motor Devices Co., Chicago; first vice-president, C. E. Thompson, Steel Products Co., Cleveland; second vice-president, E. H. Broadwell, Fisk Rubber Co., Chicopee Falls, Mass.; third vice-president, T. J. Wetzel, Precision Die & Casting Co., treasurer, L. M. Wainwright, Diamond Chain & Mfg. Co.; assistant treasurer and secretary, W. O. Rutherford, B. F. Goodrich Co. Mr. Sloan, formerly assistant treasurer, remains a member of the board of directors.

To Win the World War *in the* Third Dimension

Aviation Program and Speed at Which It Is Being Carried on Revealed

By Darwin S. Hatch
Editor Motor Age

NEW YORK, Jan. 11—That plans of the interallied War Council for winning the war involve the use of American aircraft to a greater extent than has been generally known and that we are producing the planes and fliers at a rate which will make this possible was revealed by five of the men most directly responsible yesterday. Addressing the Society of Automotive Engineers, those responsible for the standardization methods which have made this program possible, Howard Coffin, chairman Aircraft Production Board, Col. V. E. Clark of the Aviation Section of the Signal Corps, Major Jesse G. Vincent of the engine division of the Signal Corps, Capt. Howard Marmon of the same division, and H. M. Crane, chief engineer of Wright-Martin, gave an outline of the extent to which the American aircraft figured in the general war plans that opened the eyes of the engineers. Mr. Coffin at the annual banquet of the S. A. E. gave a broad outline of the American program and how it was being carried out. The others went into the details in a symposium on "The Reasons Behind the Liberty Engine," which formed the feature of the professional sessions.

To a greater extent than in previous years of the war reliance is to be placed on the huge bombing planes, flying in squadrons and dropping tons of explosives on and behind the enemy lines. The proposed extensive use of the bombing planes was explained in detail by Colonel Clark. As he explained it, this plan contemplates using thousands of the large bombing planes in squadrons of from a score to 100 each and each plane carrying hundreds of pounds of explosive and incendiary bombs. Imagine this fleet of the aerial navy, protected by its mosquito fleet of fast fighters, rising from behind our lines some night next summer. At a very great altitude and at a speed of 100 m.p.h. the fleet sweeps over the enemy lines and into interior Germany, where the vast munitions plants are established. Here above the menace of the searchlights and the anti-aircraft guns, protected from enemy planes by their swift fighters, each unit of the bombing fleet picks out its pre-determined objective and drops its bombs. Some of the bombers carry high explosive bombs to be released upon the great munitions works and supply depots to destroy the source of supply. Others sweep the areas occupied by the factory laborers with incendiary bombs to retard reconstruction and break down the morale of the munitions towns.

Imagine another but similar fleet behind and closer to the enemy lines, destroying railroad tracks, bridges, stations and wagon roads as well as the supply dumps behind the lines. Thus will not only the sources of supply of the enemy be destroyed, but all connection between the enemy front and its bases in the rear will be cut off.

On the average, according to Colonel Clark, three nights of each week offer atmospheric conditions for the work and if these vast expeditions through the only gateway into enemy territory are made three nights per week it cannot be long before the enemy front will be a beleaguered line at the mercy of infantry, artillery and air attacks. But the enemy will not be long inactive while this is going on. Here fighters and pursuit planes will be rising in hundreds to attack the Allied raiders. Success for this plan can come only through complete mastery of the air by the allies.

It is for this mastery that the allies look to America. It is the success of America's aircraft production and training program which will make this possible. Just what this program is and how it is being carried out, as told by Howard Coffin, is given elsewhere in this article. I quote him here on only one important feature.

"Airplanes and engines of the very latest European development are going into production in the United States as quickly as, and perhaps more quickly and in greater quantities than, in all old countries. The feat of getting the twelve-cylinder U. S. A., or so-called Liberty engine, from the first scratch on paper in June to the beginning of quantity production with quantity manufacturing tools in November is one never equalled, even among the spectacular performances of the motor car industry."

Quantity production of the Liberty engine is one of the chief features of the aviation program. Now that it is in actual machine production in one factory and will within a few weeks be in production in quantities from several others and each week at increasing rates, the prime question regarding this engine is, "Will it do the work?"

It will. Flying tests during the last week have shown that it performs in actual service in the air as well as its block tests lead its designers to expect. That by the way is a performance which exceeded that of the best aviation engines in Europe.

Major Vincent, who with engineer Hall, was chiefly responsible for its design, gave the figures of 50-hr. wide open tests which show up each 2 lb. of engine weight. This is better than the most popular European engine. The best European engine, which develops from 200 to 220 hp., weighs from 500 to 520 lb. The twelve-cylinder Liberty engine weighs 800 lb. and develops a little more than 400 hp.

This power is developed at a crankshaft speed of 1625 r.p.m. It is capable of greater power production at higher crankshaft speeds, but that is as high a speed as the propeller will be

efficient. When more power is needed there is a possibility of gearing the propeller to hold the latter at under 1700 and run the crankshaft faster.

Details of the engine, many of which have not been made known before were given Major Vincent and Mr. Crane. Inasmuch as the demand at the front is for the most power, the Liberty engine is being produced and will be produced so far as known now only as a twelve-cylinder.

It will be remembered that the design is such that the same cylinders can be used in any one of the four engines, four-, six-, eight- or twelve-cylinder, and nearly all parts except crankcases and crankshafts are interchangeable among the engines of different size.

The first ten sample engines were coming through as eights when word came from the front urging that efforts be concentrated on the twelve. It gives an insight into the prediction of the interchangeability when it is said it has been found so advantageous in the case of the Liberty engine to have a design fitted to American production methods and available American engineering experience that it is evident that before the program has advanced many months plane designs will follow the same idea and be entirely of American design and construction rather than copies of European designs and detail unfitted to our manufacturing experience.

The samples originally intended as eights were assembled as twelves with very little delay. The cylinders are made from steel tubes, have a bore of 5 and a stroke of 7. The valves are driven by an overhead camshaft, the camshaft with the conventional bevel gear drive, with a Packard aviation type of rocker arm. Valves are 2½ in. in diameter in the clear with a 30 deg. seat. Exhaust lift ⅜ and intake 7/16. Cylinders are set at a 45 deg. angle. Pressure fuel feed with blow-off valve is used. The engine uses .025 lb. of oil per hp. Lubrication is a simple pressure system with double-deck oil pump using three gears and two pumps, one for the front and one for the rear to an outside tank. There is no oil in the crankcase.

Production of the Liberty engine as a standardized engine of special and purely American design was decided upon because it was found impossible to adapt any one European design to American big production methods as practiced in our motor car factories. Also no authorities in America or Europe could agree upon which European type would be best for America to build. So the Aircraft Production Board took what it thought to be the best features of each of the European engines, adapted them to American machine tool methods of manufacture and had the different factories in the motor industry build them complete or in part.

Coffin Outlines Program

In outlining the whole American aviation program and the most rapid progress made thereon, Mr. Coffin said that:

1—The United States is to establish and maintain a great system of training stations, adequate both in ground schools and flying schools to provide preliminary training for the personnel schedule.

2—To accomplish an international standardization in aircraft materials, in detail of design and types, and to achieve such co-ordination of effort as will concentrate the manufacturing facilities of the various Allied countries upon the minimum number of types of those machines for which the producing equipment is best fitted.

"International specifications for aircraft materials have been prepared under the direction of the board by a committee representing the Allied countries. A complete co-ordination of manufacturing facilities and policies has been agreed upon between the Allied powers."

3—To construct primary training machines of quality and quantity approved by the joint Army and Navy technical committee.

"The production of standardizing training machines approved by the joint army and navy committee will be in excess of the needs of the program on Jan. 20."

4—To provide, equip and train personnel for flyers and mechanics in accordance with schedule recommended by the joint Army and Navy technical committee.

"This program is progressing exactly on schedule. The training of both fliers and mechanics is provided for in this and in allied countries. Thousands of mechanics are being put into actual service with the Allied forces. American fliers are in training in the United States and abroad, and it is probable that the original program for pilots will be increased."

5—To provide raw and semi-finished materials and finished parts, including engines, to insure the consummation of the augmented Allied aircraft building programs.

"This has been and is being done."

6—To provide for the equipment of the American forces in France for the period of January to June, 1918, in large part by purchase of fighting machines manufactured in Allied countries and to supply the machine tools and raw and semi-finished materials necessary to insure their production.

Pershing Ordered Machines

"One of the first acts of the aircraft board after the passage of the appropriation bill in July was to authorize the placing by General Pershing of orders for several thousand fighting machines in Allied Countries. Many millions of dollars' worth of materials and machine tools have been shipped from this country to aid this production."

7—To provide completed service machine, including combat and bombing types, for American need after July, 1918, and for such shipment of the finished product overseas as tonnage might permit.

"In accordance with the plans originally agreed upon with Allied Governments it was deemed advisable to provide for advanced training overseas adjacent to the actual theater of military operations. The training facilities thus provided have been overcrowded, with the resultant request that early arrangements for advanced training be made in America. To meet this change in program delivery of advanced training planes will begin this month, and within ninety days will have met requirements. The engines of general design for this advanced training schedule are already in quantity production in this country."

Federal Action on Aviation

Before Mexican campaign, less than	$ 1,000,000
May, 1916	13,000,000
April, 1917	68,000,000
Last summer	640,000,000

TO PROTECT ARMY CARS

Washington, Jan. 12—Interference by state or local police with army motor cars is to be prevented by military authorities through instructions to drivers of army cars directing such drivers, where a police officer stops an army car because of its failure to bear a state license, to explain the ownership and use of the car by the Government. In case obstructive measures are then resorted to by state or local authorities, the order says, a report is to be made to the adjutant general with a view to submitting the matter to the Department of Justice for legal action to make clear the rights of the United States.

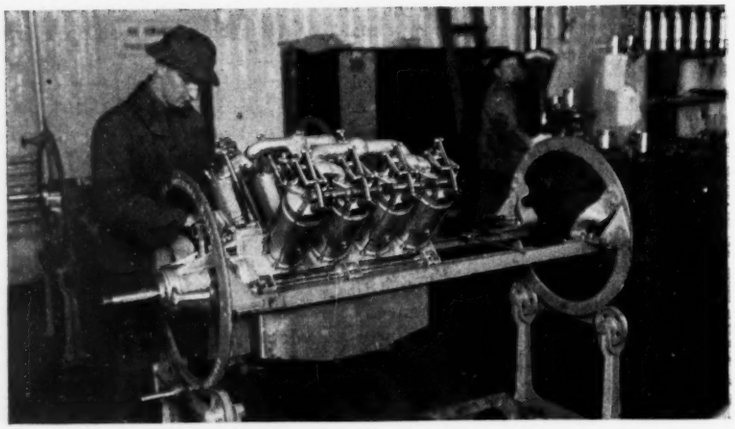
Drivers of cars are directed to observe regulations as to speed and traffic scrupulously. It is stipulated that none of these instructions applies to private cars of army officers, and the use of special tags marked "U. S. A." on private cars is forbidden.

This particular order is issued in connection with earlier instructions that military cars will bear only the legend "for the Quartermaster Corps," with the initials, "Q. M. C., U. S. A.," and the number of the machine underneath, or similar tags for ordnance, medical, signal corps or engineers' cars.

AIR PROGRESS PLEASES DANIELS

Washington, Jan. 12—Secretary of the Navy Daniels expressed himself as being completely satisfied with the progress of the Naval aviation program. Machines are being constructed in public and private plants with all possible speed, he stated, and adequate numbers of aviators are being trained. The Secretary added that the Philadelphia Government airplane factory is doing excellent work and that he also is getting many machines from Ford, Packard and other motor car factories as well as from some of the furniture and piano plants.

Getting the Bird Army Ready

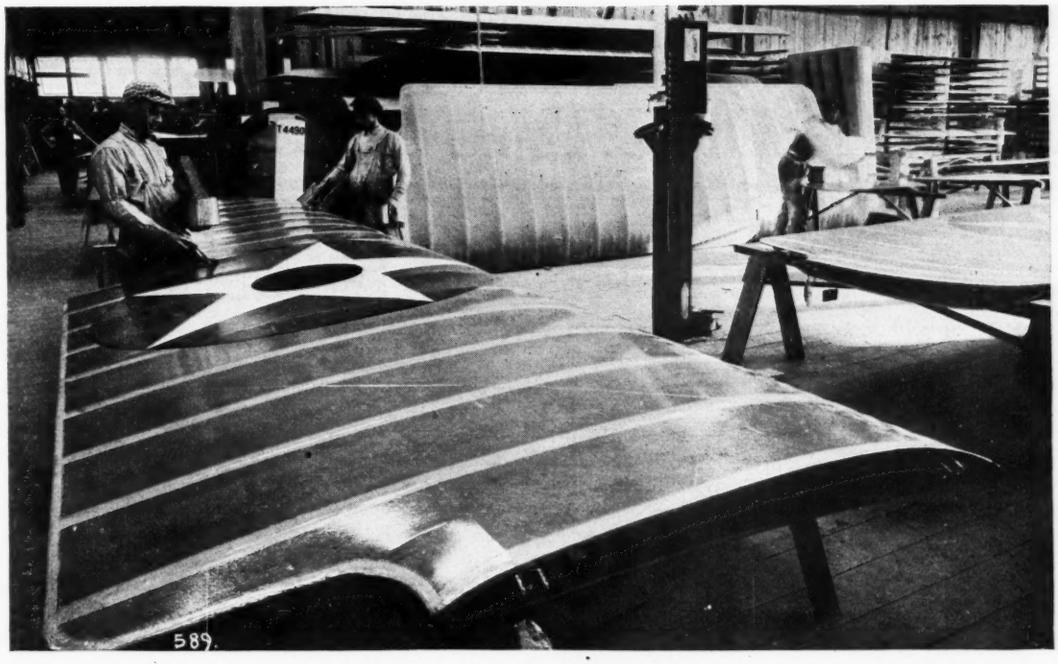


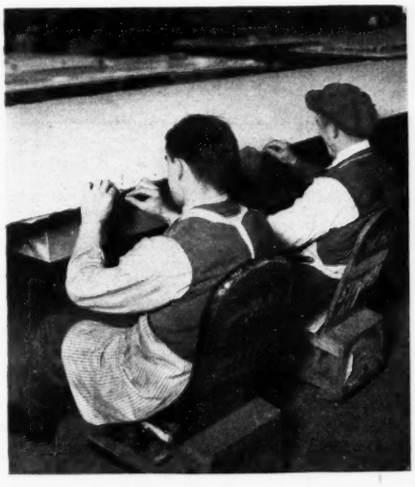
Two phases in building a Liberty engine, left and above—Note the screen guarding the propellor

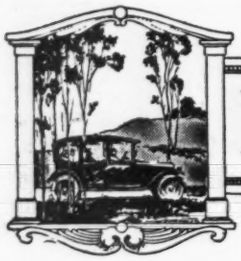
Young aviators are here shown while studying the different parts of the U. S. A. Liberty engine above, and learning to be radio operators below, for the modern plane now flies with wireless equipment

Uncle Sam's Eagles of Liberty Prepare to Blind the Kaiser

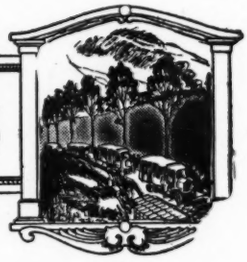
On this page are shown various phases in the manufacture of the U. S. A. Liberty engined airplanes, from painting the wings back to real tailoring by men from outside the airplane industry, tailors by trade







EDITORIAL PERSPECTIVES



War, Production and World Trade

THE war will practically pay for the enormous sacrifices it has and will cost by the fact that the production of commercial articles and foodstuffs has grown to a volume which would have been impossible in normal times. It is certain that each of the world powers engaged in the present struggle will make a tremendous effort in the reconstruction period to follow peace, to dominate world trade. This is obvious as the national debts will be the great burden furnishing the incentive toward this objective. This leads us directly to the question of industrial preparedness. Even now, during the war is the time in which to lay the foundations for future commercial successes. In this, we are aided directly, as the war in its final analysis is simply a combat of industrial efficiency.

THE domination of world trade is dependent upon two factors, production and marketing ability. The former factor derived its real meaning from Yankee ingenuity and American manufacturing methods, incorporating standardization of parts and the adaptability of automatic machinery to their manufacture. We possess but few skilled mechanics, therefore must depend upon standardization for large production at low cost and this is the intrinsic explanation of the wonderful rise of the mechanical industry in America. Transportation is the chief feature of the latter factor, which will require a merchant marine, well balanced railroad systems, motor vehicles, aircraft, etc. Heretofore overseas trade has been hindered due to the lack of transportation facilities, necessitating to a great extent the use of foreign bottoms but the present shipbuilding plans will reverse this condition and once more American merchandise will be carried in American ships.

SOUTH AMERICAN trade, formerly controlled by European nations is now an open field almost without a single competitor. The chief demand is for mechanical machines, especially the products of the automotive industry. It is to the advantage of the American manufacturer to make the best of the opportunity and thus establish a commercial relation with these countries that will be in the future difficult to displace.

Ease of Maintenance

ALTHOUGH the last year has been comparatively quiet so far as radical changes in chassis or body are concerned, it is gratifying to note that designers are paying more attention to constructions tending for greater ease in maintenance. This year we find better methods of mounting the windshield, which is often one of the first to rattle, owing to the supports becoming loose. In at least one case the supports instead of fastening directly to the cowl are carried through the latter to the frame of the car where they are securely bolted. Thus the windshield instead of having a tendency to pivot on the cowl has two points of support and the danger from looseness with its attendant rattle is reduced to a minimum.

FENDERS are attached better also. The tendency is for pressed-steel brackets in place of drop forgings. Also the bracket where it attaches to the fender is spread over a wide area so that the point of contact is greater. This means better rigidity and less likelihood of the bolts or rivets pulling through the metal from vibration.

RADIATOR splash guards continue in favor and in a number of cases they have been made larger, while some designers fit a splasher guard on the rear of the car. However, there is still room for improvement in keeping the under structure of the car clean. Certainly a sod pan which ran the entire length of the car would be a step in the right direction if it were more widely used. The average owner abhors getting under his car to make adjustments on parts that are covered with mud or rust. Accessibility, it seems, could be gained by providing some kind of spring catches to hold the sod pan in place and by which the latter could be removed. Not only would the parts under the car be kept clean and in better shape for quick adjustment, but the pan itself could be cleaned more easily when detached. It is easier to wash mud from a detached undershield than to get under the car and do it.

Locating the Battery

IT is apparent by analyzing the various chassis offered this year that there is still little effort being put forth to locate the storage battery in a position where it will be convenient for the average driver to care for it. The battery is located in every conceivable position from the running board to being buried in some out-of-the-way place under the body. The life of a battery naturally is short on account of the rigorous service to which it is subjected, but its life can be increased if it receive a certain amount of attention. It is a trait of human nature to neglect a thing which is inaccessible and the battery usually receives but a small part of the attention it requires.

EVERY designer has a different idea of what the external appearance of a battery should be, and it is noted by studying average motor car practice that the size and location of a battery is about the last problem considered in a design.

SOME battery manufacturers are producing as high as 200 different sizes of storage batteries. This fact alone prevents quantity production and necessarily makes the battery rather expensive. This could be avoided if production could be concentrated on ten or twelve types. This also makes it exceedingly difficult for manufacturers' and dealers' service departments on account of the large parts stock which must necessarily be maintained in order to render anything that even resembles service. With fewer sizes of storage batteries service would be simplified to no small extent.

IT seems that some real pioneer work must be done by some one to remedy this most unsatisfactory condition. Standardization of sizes and location will relieve this situation, facilitate manufacture, simplify design and render service both by the manufacturer and by the dealer much easier.

Better Times for Car Business

Increasing Confidence Causes Dealers to Store

DETROIT, Jan. 11—The industry has moved temporarily to New York, to attend the show. The coal shortage is still acute, freight car congestion bad and manufacturers having Government work are concentrating in placing that work in production. There is a strong undertone that indicates an increasing confidence in business conditions and predictions for particularly good business in the spring and summer.

Particularly is this reflected in the attitude of local dealers. Detroit dealers are fortunate in being close to the factories and the public, and in this respect are quicker to sense coming changes in business conditions. A canvass of the larger local dealers shows a renewed confidence on the part of the public. This as yet has not affected sales materially, but the number of unsolicited inquiries is increasing, and the live prospects for spring and summer business are large. The dealers have passed through crises that in normal times would have been considered disastrous and in each case have weathered the storm. They now are revamping their organizations to meet the new conditions and feel that nothing more serious can happen than has happened.

Are Storing Cars

Though the Detroit dealers are located close to the source of supply, and do not have to store cars as much as more remote dealers, many are storing cars in anticipation of coming business. Some are storing from 100 to 150 cars, and this is a large number for this city.

In most instances the number of used cars on hand is large, but the dealers as a whole are handling the situation carefully. It is to-day difficult to sell cars on anything but a time payment basis, and in most cases a used car is taken in trade. In general the conditions are worse in this respect than last year, and the attitudes of the dealers vary. Some state that the demand for used cars will be exceptionally active, and others fear that the reverse will be true. But it is certain that a good used car, taken in on a fair basis and sold at a correspondingly fair price will find ready sale.

Used car dealers report a marked increase in business in the last two weeks, an increase that always has occurred at this time in the past. While in the case of new cars, prospects desire to wait until the shows before purchasing, such is not the case in used cars.

The salesman problem seems to be exceptionally bad. Not that it is impossible to get men. It is not. The problem is to get the type of man that makes a good salesman. These are usually the younger men. These are either in the army or else already employed. The same is true in the service departments, and it is possible that many older men will again come into their own.

This in general sums up the business conditions locally, and in many respects the conditions throughout the country, particularly in those parts supplying material required in the war. At present business is quiet. The prospects for the future are not phenomenal, but the outlook is better than any time since the war started.

When Chicago and North Pole Met!

What the snow did to Chicago row. These are just a few of those necessary to dig the row out of the drifts

Alone in the desert, or so one might rhapsodize on this poor, lonesome car lost "somewhere in the snowdrifts"

Kettering Heads Motor Engineers

Delco Man Elected President of S. A. E.—Beecroft, First Vice-President—Liberty Engine, Standardized Truck and Future Fuel Possibilities Feature Meeting

NEW YORK, Jan. 11—Charles F. Kettering, vice-president of the Dayton Engineering Laboratories Co., is the president-elect of the Society of Automotive Engineers. David Beecroft, directing editor of the Class Journal Co., is first vice-president. The complete slate follows:

President—Charles F. Kettering, vice-president Dayton Engineering Laboratories Co.

First vice-president—David Beecroft, directing editor Class Journal Co.

Second vice-president—C. C. Hinkley, president and general manager Hinkley Motors Corp., representing motor car engineering.

Second vice-president—George H. Houston, representing aviation engineering.

Second vice-president—Fred Glover, Emerson-Brantingham Co., representing tractor engineering.

Second vice-president—Henry R. Sutphen, vice-president Submarine Boat Corp., representing marine engineering.

Second vice-president—H. R. Brate, representing stationary internal combustion engineering.

Secretary - General Manager—Coker F. Clarkson.

Treasurer—Charles B. Whittelsey, vice-president Hartford Rubber Works.

Councillors 1918

B. B. Bachman, engineer Autocar Co., Ardmore.

H. L. Horning, engineer Waukesha Motor Co., Waukesha, and chairman automotive section of the War Industries Board.

C. W. McKinley, chief engineer, Willys-Overland Co.

George W. Dunham, past president.

Russell Huff, past president.

Councillors 1919

Charles S. Crawford, chief engineer Premier Motor Corp.

Charles M. Manly, vice-president and chief engineer, Curtiss Aeroplane Co.

J. V. Whitbeck, chief engineer, Chandler Motor Car Co.

The regular winter session of the Society of Automotive Engineers was held here yesterday at the Engineering Societies' Building. The program terminated in a banquet at the Hotel Biltmore, which was attended by 1100 members of the society and guests. This is the thirteenth annual meeting of the organization which, during the year, has changed its name, being formerly the Society of Automobile Engineers.

During the year of 1917 the membership of the organization has grown from 2120 to 3119, this being largely due to the expansion of the field of the organization from the motor car line to embrace also the other automotive industries, including airplane, tractor, motor marine, motorcycle and stationary plants employing internal combustion engines.

The society is in excellent financial condition, having invested during the year in $24,000 worth of Liberty bonds and more than $12,000 in other bonds and securities. Its work along the lines of standardization has been paid for in part by donations of the motor car and accessory trade organizations. The large addition of members has also brought in a substantial financial return.

A notable program was arranged, the morning being given up to routine matters, such as the business meeting, president's address, election of new officers and standards, while the afternoon was taken up by the professional session. The latter was the best attended in the history of the organization, the auditorium of the Engineering Societies' Building being packed to capacity. The program for the professional session was divided into three parts, the first being "Reasons Behind the Liberty Aircraft Engine"; the second, "Reasons Behind the U. S. War Truck Design," and the third, "Fuel for Automotive Apparatus." The speakers were: Col. V. E. Clark, Major J. G. Vincent and H. M. Crane on aircraft; C. T. Myers on the war truck and Dr. E. W. Dean on fuel. Reports on these talks are given elsewhere.

John Kendrick Bangs was toastmaster of the banquet, the speakers being Major J. G. Vincent, Howard E. Coffin, chairman of the aircraft board, Captain M. E. de Jarny, French Military Mission, and Charles F. Kettering, president-elect S. A. E. Speeches were largely taken up by matters pertaining to the war, and the meeting was made the occasion of demonstrations of a patriotic nature and of friendship for the Allied nations who were largely represented by the attendance of officers of the French, British and Italian armies.

George Dunham, in opening the meeting, spoke of the rapid growth of the organization during the last year and dwelt particularly on the patriotic service rendered to the Government by the organization and which is clearly recognized by the Government. He told how the word automotive, coined by some of the members as a part of the name of the new organization to indicate its wide scope, has become a general term which is well recognized. The meetings have been well attended. President Dunham pointed out, particularly at Kansas City and Fremont last summer at the tractor sessions and also at the summer session in Washington, where it was necessary to hold an overflow meeting because the capacity of the Bureau of Standards was over-taxed.

President Dunham stated that the Government appreciated the great work of the S. A. E. in connection with the standardized Government trucks, which are in three sizes, and also in the design of the Liberty aircraft engine. This work is going on rapidly, particularly in the standardization of airplane parts, many of the latter standards being adopted by the International Standards Board. The Government's standard motorcycle has not been completed as yet, but society members are doing important work in connection with this design also. There are now over 125 members of the organization who are commissioned officers.

Two new sections have been formed, one of these at Buffalo and the other at Minneapolis. The journal of the society has grown from a small bulletin to an important record of the activities of the organization in all fields. Larger quarters have also been added to the headquarters.

Reports by the treasurer and by the membership committees showed the society to be in a healthy state in both directions. The net profits for the year are $16,930.96, due to an income of $113,227.97 and an expenditure of $96,297.01. The membership has increased by 1,000, as indicated in President Dunham's address.

The entire report of the standards committee was accepted by the association and, in addition to the work reported in last week's Automotive Industries, the marine standards were also adopted as well as those of the miscellaneous, tire and rim and tractor divisions.

Action was taken to waive the dues of members of the organization who are with the forces in France during the period of the war.

"The Reasons Behind the Liberty Engine"

THE Liberty aviation engine furnished the basis of the most important part of the entire meeting of the Society of Automotive Engineers in New York last Thursday. Col. V. E. Clark, Major J. G. Vincent and H. M. Crane of the Wright-Martin Aircraft Corp. took part in the consideration of the engine, how it was designed and how it was built in twenty-one days. Colonel Clark spoke of the requirements of different types of planes. He went into the uses of the single-seated and double-seated combat and observation machines, the heavy types of bombing machines and the requirements of pilots in operating different types.

Major Vincent spoke of the process by which the Liberty engine came into being and told why the entire program was put in the hands of a few instead of being distributed among many, explaining that had the latter been done a production basis would have been impossible even though good engines no doubt would have been designed. The Liberty engine was pointed out as six or eight months in advance of the best European type now in use as well as a production engine which can be turned over to factories throughout the country for manufacture. Mr. Crane told of the manufacturing behind the engine, the engine being adapted to the industry instead of the industry to the engine, and explained why a successful production engine had to be designed in sympathy with methods of American factories because foreign engines do not permit American methods to be used readily.

In considering the talks of the three men in the order of their sequence that on the military types of airplanes comes first. In this war, said Colonel Clark, the allies have more types than the enemy has. One reason for this is that the allies have listened more to the demands of the pilots. America is trying to select those types that render themselves readily to standardized production.

The various military types can be divided into airplanes of observation, of combat and of destruction. None is new, and each has different functions. Those of observation act with field artillery and the infantry and keep in touch with lines of communication, keeping commanders in touch with movements, take photographs, make maps beyond the lines, and dive down and inflict damage on trenches by machine guns. It is hard to draw a line between these types. The airplanes of observation may carry two or three men. The latest development in France is the army observation machine for three men, in which the engine has 500 hp. Airplanes of combat and pursuit usually are single or two-seated. Each, of course, has its advantages. The development of more powerful engines will mitigate against the single seater, and eventually it may be replaced entirely by the two-seater.

Planes of Destruction

The airplanes which do the real damage are the third type, those of destruction. Of course, a very brilliant fellow can go up and bring down ten of the enemy, but bombing airplanes will inflict the real damage. The bombers are divided into day and night machines and are entirely different. The day bombers carry two men. For the present we have to stick to one propeller on the day machine. They bomb headquarters, ammunition plants, factories, trenches and warehouses. They do photographing also. They must be able to protect themselves from all possible aircraft.

It is not economical to send trained pilots a great distance beyond the lines, unless the machine carries from 600 to 800 lb. of bombing material. It should carry two or three machine guns. Day bombing will be done in the future in formation with as many machines as can be flown without any particular risk of collision. These will be in multiples of five. The German Gotha has two 260-hp. Mercedes engines. This type has bombed London during the day.

The night bombing will inflict real damage. The night bomber is different from the day. It is not necessary to be fast. Night fighting is almost unheard of. The primary requirements are good bombing capacity. Two Liberty engines carrying three or four men should be able to carry roughly, at least 1 ton of bombs. Two pilots are carried, the chief pilot and the bomber. Machines that have a ceiling of 10,000 ft. running 85 m.p.h. are ample. Greater speed means more power or less carrying capacity. In the case of a machine with two Liberty engines for every 16 miles range, 100 lb. of bombs must be sacrificed.

The number of night bombing airplanes built and supplied should depend solely upon the number of pilots available. It depends upon the work they have to perform. They cannot be put closer than 1000 yd. without tangling the wireless communications. The number built depends upon the strength of the army. There is no limit on bombing machines. The number also will depend probably on steamship space for transportation and possibly upon the appropriation. Each airplane carries 1½ tons of bombs. If we could send out 500 machines every third night, each dropping 500 bombs on the factory towns, there would not be much war after that. That would wreck all railroads, and telephone and telegraph lines then would be destroyed.

In tracing the steps in Liberty engine development Major Vincent went back to the time, in April and May, when the Government was deciding the airplane program. Considerable effort was put into going over the situation. The Aircraft Production Board was in charge. The French and English agreed there was nothing here that would be of value at the front. America did not have the engine they wanted then. It finally was decided that the United States should get together all the best embodied in the airplane engines of the Allied nations and combine them. The object was to combine all the benefits of the experimental work of the allies and at the same time produce manufacturing results such as the Germans had obtained, that is, cut down to the fewest possible parts. The scheme as originally laid out consisted in making several engines of interchangeable parts, cylinders from four to twelve and possibly more, if that seemed desirable, later.

First it was decided to build an eight-cylinder of approximately 250 hp., but before that was completed the twelve-cylinder of more than 300 hp. was requested, because the cry for more power was being heard. This country had men on the other side sending information and took this information and combined it with its own experience to produce a standardized aircraft engine.

It also was decided that it was absolutely necessary to design this engine and have the Government follow it through so manufacturers could produce in quantities. Motor car engineers co-operated, and June 4, Major Hall and Major Vincent received an order to produce ten sample engines. They went back to Detroit and got out rough detail drawings, and the first engine was produced in twenty-one days through everybody's co-operation. The first built in twenty-one days was an eight-cylinder.

The importance of having a standardized engine is evident. If two planes are identical except for the engine it is almost impossible to take out one engine and put in another without redesigning the plane. When the twelve-cylinder was finished it was put to test and no adjustment was made through a 50-hr. run. The run was not at maximum horsepower, because the engine was designed not to run open on the ground. It developed 2 lb. to the horsepower. Since then the engine has demonstrated that it will run for an indefinite period wide open on the ground and develops 400 hp.

While this was being done the Aircraft Production Board was arranging for manufacturing facilities. The equipment for making steel cylinders is a very large proposition alone. Everything was taken up and studied carefully. Each factory will produce the same thing and have interchangeable parts as far as possible. Nothing but twelves is in production, because it is the one with the most power. It gives more than 400 hp., and that is all that can be used efficiently to-day.

In speaking of Liberty engine production problems H. M. Crane told how in laying out a production schedule the entire industry has to be taken as it is and not in some different way. The most successful engine, he said, is the one designed to meet the factory idea and temperament. If it is not so designed, production is delayed. Production with a foreign engine would not have been half what can be expected from an engine designed in this country with the knowledge of all the American factory practice. When Mr. Crane read in the newspapers early in the summer that an engine had been designed in two weeks he was very much surprised, but later he found that this was only the final printing. What had occurred was a year or two years of development, always thinking in terms of American methods.

Mercedes an Illustration

Mr. Crane has been working on a foreign engine which was designed by the best production engineer on the other side and which, for that reason, has been so successful on the other side, and yet it contained difficulties that had to be met. This country is not only distant in miles from the other side but in way of thinking. It is difficult to copy foreign practice. The Mercedes is an illustration. That has been copied by many, but no one who has copied it has reached its efficiency or usefulness. The makers who have started to copy it and who reached a fine product have altered their processes and d ign very materially. That would happen here if a foreign design were adopted. The best foreign designs are not inventions. An aviation engine must be of the simplest form, and the Liberty is the embodiment of the simple idea of compactness, which makes for light weight and reliability.

Following the talks on the Liberty engine, Major Vincent expressed himself as ready to answer all questions regarding the Liberty engine, and for nearly an hour there was a running fire of questions covering the engine. It was impossible to leave the meeting without feeling that America has the best aviation engine that has been produced. The more important responses to inquiries follow:

The cruising radius of the plane is a matter of load, speed and plane design. It is easily up to 600 miles.

The twelve-cylinder will be the only Liberty engine in production. There is no idea of building anything else at the present time. There is no doubt, however, that improvements will be incorporated from time to time, and a gear type may be added to the direct-connected engine now manufactured.

Regarding ignition, the increased speed and number of cylinders make it very questionable if the magneto is the best form. Two separate sparks per cylinder must be furnished and they must be independent in every respect so that should one

go out of order the other will fire regularly. While the magneto is now questioned, there is every disposition on the part of the engineers to listen to suggestions on both types, and the ignition, as now provided, is at least as good as could be designed. The committee is going right ahead with what they have in ignition at the present time. An interesting point is that nobody so far has offered a system as light as the one now in use.

Regarding weight per horsepower, the engine originally weighed 786 lb. and delivered 400 hp. at 1625 r.p.m. Due to the strengthening of certain parts the weight has been increased and is now 801 lb., giving 2 lb. to the horsepower. The weight per horsepower on the best French machines, such as the Hispano geared type is 2.36 lb. per horsepower, as the engine weighs 520 lb. and produces 220 hp. There are two compressions on the present Liberty engine, a compression ratio of 5 to 1, or 20 per cent, being used on the Navy machines and a ratio of 5.4 to 1, or 18 per cent, on the Army machines. This is because the Army machines do their flying at above 10,000-ft. elevation and get up to this height just as soon as possible. This compression is based on the best practice abroad, although experiments are being made on higher compressions, and it is known that a 6 to 1 ratio can be provided without trouble.

Lubrication of Engine

For lubrication the Government is trying to get castor oil, but a good grade of mineral oil is quite satisfactory. The supply of castor oil lately has been increased, but there is no difficulty on the score of lubrication.

In answer to a question at this point, Colonel Clark stated that the average life of a combat machine is two months, or about 100 hr. of flying and fighting. Observation machines have a slightly longer life, the average being about three months. The bombing machines have an indefinite life, generally ending their careers through wear rather than through actual damage.

There is a great amount of research work still to be done, particularly as regards performance at altitudes above 20,000 ft., and it is this high altitude work which is most important. The lessons learned by studies at the top of Pike's Peak have not all been applied as yet, owing to lack of time. The 400-hp. engine means only 200-hp. to the aeronautic man, as he is used to operating where pressures are down to 45 per cent of atmospheric.

Regarding spark plug trouble, it has been possible with the special design of cylinders to bring the water close to the plugs. The Liberty engine is not a hard engine, relatively speaking, as regards spark plugs, particularly as no really extreme compressions are used. Carburetion is not exactly right even now for the high altitudes. No starter is necessary on the machines now under construction, as it is impossible to stop the Liberty engine once the machine is in the air, as it cannot be driven slowly enough to stop the engine from turning over.

Regarding the possibility of the engine with four valves per cylinder, Major Vincent stated that there is no necessity for this as four valves are harder to cool and are apt to cool unequally. Until the lift equals a quarter of the diameter of the valve, the full value of the valve is not obtained. There is a possibility at some future time of an engine with two inlet valves. There is no radical feature in the valve timing, as the exhaust opens 52 deg. before bottom center and the intake closes 45 deg. as to bottom center.

The ignition apparatus weighs 29 lb., including the battery. The fuel feed is by pressure system, with a pump on the engine and a blow-off valve in the tank. The valve mechanism is operated by a rocker through a bearing, and any oil getting out must escape through this bearing, thus lubricating it. The piston clearance was at first set at .016 in. but after increasing the diameter of the valve $\frac{1}{16}$ in., resulting in a gain of 12 lb. brake mean effective pressure, the clearance was raised to .020. The piston is straight up to the bottom of the top ring. The engine is a dry crankcase type, and the cylinder dimensions are 5 by 7. The period of the engine is a 1200 r.p.m., and in making tests propellers are used while the power curves are taken on an electric dynamometer. Domestic materials only are employed in the manufacture. The valves are 2½ in. in the clear with a life of ⅜ in. for the exhaust and $\frac{7}{16}$ for the intake.

The Rolls-Royce engine develops 360 hp. while the Liberty engine develops 400 hp. The gain is due to the omission of excess parts and material. The water carried depends on the location of the radiator and will average from 10 to 12 gal.

N. A. C. C. Record Shipments

NEW YORK, Jan. 11—The total shipments of cars by members of the National Automobile Chamber of Commerce and the country in general for 1917 greatly exceeded the shipments of 1916 or any other previous year in the history of the industry. Taken month by month the shipments during 1917 exceeded those of the previous year with the possible exception of December. There was no slowing up on production until a shortage of materials arose in October, and during October, November and December production figures fell below those of the corresponding months of 1916.

FUELS FOR WAR TIME

New York, Jan. 11—That a decrease in the supply of fuel for home consumption during the war is the prospect for the immediate future was the opinion expressed by Dr. E. W. Dean in his address on "Fuels for Automotive Apparatus" before the S. A. E. here yesterday. Doctor Dean, who is a Government expert, does not believe the gasoline supply situation will be relieved after the war closes either. Extracts from his talk follow:

The term "gasoline" generally is recognized as rather indefinite, and defining a product applied to a certain use rather than a product of any definite property. The best definition of gasoline at present seems to be "a liquid fuel that will start an automobile engine and keep it running after it is going." Any definition that deals with particular and definite performance usually gets in trouble.

The present refining practice includes three major methods of producing gasoline. One is the ordinary refinery process of distillation from the crude petroleum. The second method is the cracking process. The third is the natural gas. Large quantities of valuable motor fuel are extracted from certain varieties of natural gas either by processes of compression and condensation or by washing with heavier oils.

These types of products have certain characteristic properties. The straight refinery gasoline usually is composed of hydrocarbons that are decidedly inactive when subjected to chemical treatment. The physical properties of straight refinery gasolines are widely variable in quantity. They depend entirely or practically on the method used in refining gasoline. The most important property from the point of internal combustion engineering is that of volatility. All methods used vary somewhat but in general they are similar and furnish satisfactory basis of comparison.

The prospect for the immediate future during the continuation of the war seems to be that there will be a decrease in the supply for home consumption. It is conservatively estimated that during the present year the military activities will require at least a fifth of the production and that it is bound to have some effect on the market. The military gasoline is likely to have higher volatility, and for that reason the home market is likely to have to make up the difference and use less volatile gasoline. Another possibility is that refiners may have to use less sulphuric acid.

The prospect for the general future is not, however, one in which the successful termination of the war promises relief. The supply of crude petroleum is estimated not to last more than another generation and the continuation of actual shortage may result and it is necessary to prevent this.

One of the possible sources of motor fuel is alcohol in the future, but the price of gasoline will have to increase and the price of alcohol cease before alcohol can compete successfully. Another possible source is through coal tar distillates, benzol and other distillates.

In the future it appears that all producers in aiding to solve this problem must procure more motor fuel from the petroleum, and designers of engines must work toward higher standards of fuel economy. A certain increase in supply of motor fuel may be counted on in the coal industry.

GOTFREDSON HEADS SAXON

Detroit, Jan. 11—Benjamin Gotfredson was elected president of the Saxon Motor Corp. at a meeting of the board of directors in New York this week. Mr. Gotfredson, who will take the place formerly occupied by Harry W. Ford, has been a stockholder in the Saxon organization for some time and has been more or less identified with the activities of the company. He is known to the industry as president and organizer of the American Auto Trimming Co., a Detroit company. In addition to his position with the Saxon he will continue his connections with the American Auto Trimming Co.

JOBBERS MEET AT NEW YORK

New York, Jan. 14—The annual meeting of the National Association of Automobile Accessory Jobbers opened here today. Much of the time was devoted to a preliminary discussion of affairs which may be later crystallized by the resolutions committee. The association took up teaching salesmen to stabilize business by telling dealers facts about present conditions and that there is a big future for the accessory business in 1918. Dealers are said to be somewhat apprehensive because of rumors and are not making sufficient preparedness for the business that the jobbers feel is coming this year with between 4,000,000 and 6,000,000 cars in operation.

While President Charles E. Faeth opened

the convention the delegates stood a minute in silent prayer for President Wilson. They cheered loudly when a one-star service flag was run up for Ex-President Sidney B. Deam of St. Paul, Minn., who is now in France. At a special jobbers' meeting this afternoon the jobbers discussed the relation of overhead to discounts and the possible effect of war taxes and increased expenses on future earning. The cost of doing business is to receive full consideration at this session. The trade acceptance will also be considered.

DISBROW JOINS MOORE VEHICLE

Minneapolis, Minn., Jan. 11—Louis Disbrow, race driver and engine designer, has joined the Moore Motor Vehicle Co. as chief engineer. After attending the New York and Chicago shows he will assume full charge of the engineering department of the Danville, Ill., factory.

FRIEND BACK WITH U. M.

Chicago, Jan. 14—Otis C. Friend, who recently resigned the presidency of Mitchell, has returned to the United Motors Corp. as vice-president. Mr. Friend was under contract with United Motors and practically was lent to Mitchell, his recent resignation marking the completion of his work. He will assume his new duties about Feb. 15.

CLEVELAND SEEKS MECHANICS

Cleveland, Ohio, Jan. 11—A campaign for automotive mechanics is being conducted here by Col. Henry B. Joy, similar to the one recently held in Detroit. Examinations are being made at the Packard Cleveland Motor Co., and it is stated that 200 machine shop foremen from this vicinity are desired. These men will be given commissions in the National Army.

REO MAKES SOME CHANGES

Lansing, Mich., Jan. 14—Several important changes have been made in the Reo four for the coming season. These consist of increasing the wheelbase to 120 in., 5 in. more than that of last year's car and the abandonment of the torque tube drive in favor of the Hotchkiss type. The engine has been improved by the use of a counterweighted crankshaft and the gasoline tank which formerly was carried under the forward seat, has been moved to the rear of the chassis. The chassis now is fitted with a body of the center cowl type, mounting a sloping windshield.

Following are the prices on Reo models effective immediately:

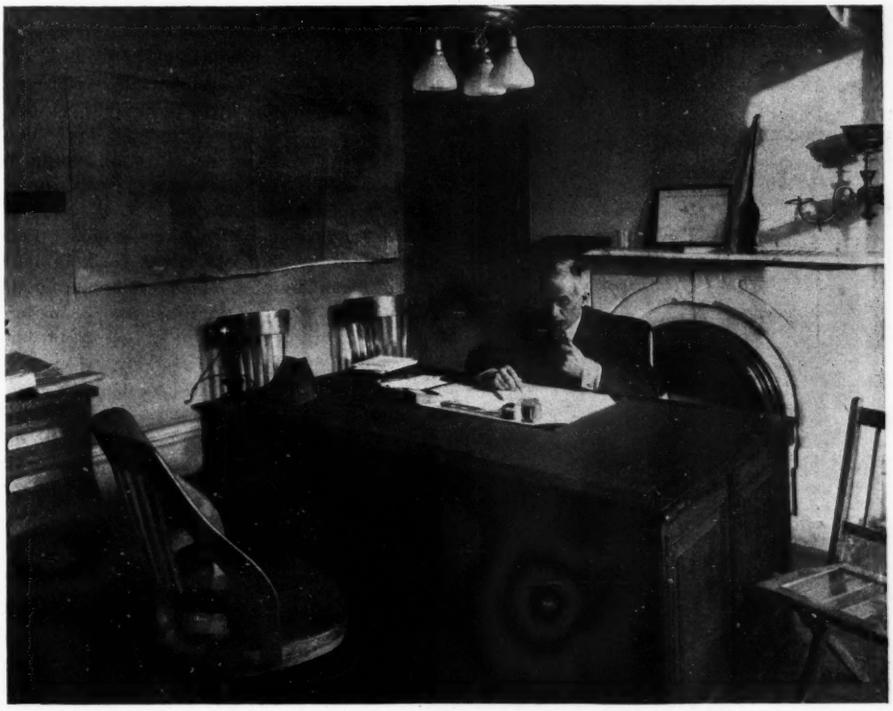
Model R, four-cylinder with Rex top	$1,285
Model S, four-cylinder roadster	1,085
Model S, four-cylinder with Rex top	1,260
Model T, four-cylinder (new), (touring or roadster)	1,225
Model M, six-cylinder	1,550
Either Rex or Bohnet top, $200 extra	
Model F, speed wagon chassis	1,100
Model F, with express body	1,175
Model J, 2-ton truck	1,800
Model J, 2-ton truck with stake body	1,950

PULLMAN MACHINERY TAKEN OVER

York, Pa., Jan. 11—The machinery of the Pullman Motor Car Co., reserved at the recent sale of the assets of the company, has been taken over by Michael Levy of Chicago and New York, and the purchaser is now negotiating with the Government for contracts to manufacture shells and other war materials. Matters at the Pullman plant were cleared up last Saturday, when Levy took over the machinery. The buildings, which are owned by Joseph Frankel, New York, probably will be purchased by the Bell Motor Car Co. of this city, a large purchaser of materials at the recent sale. The deal for the sale of the buildings to the Bell company has been in progress for several weeks.

$50,000,000 FOR AIR BASES

Washington, Jan. 11.—The expenditure of $50,000,000 for construction of aeronautic bases in this country was proposed yesterday by Secretary of War Baker in a report to Congress. The Secretary's report intimated that further information on this subject would be disclosed in closed hearings of the committees. The location of the new bases were not mentioned and the Secretary disposed of the $50,000,000 as follows: $24,000,000 for sixteen aeronautic stations in the United States; $3,500,000 for twenty balloon stations in the United States; $4,420,000 for aviation bases in Hawaii; $5,420,000 for aviation bases in Panama; $12,000,000 for equipment of the various bases.



These two pictures well might be called before and after accepting a Government position at $1 a year. Above, Christian Girl, head of the Military Production Board, appears in his Cleveland office as president of Standard Parts; below at his desk in the old building which shelters the truck board at Washington

WARTIME WASHINGTON

By Allen Sinsheimer

STANDING on the border of the District of Columbia and looking toward Washington, you imagine you have discovered a new mirage. You think you see Detroit, Toledo, Lansing and Cleveland. You mistake the Hotel Willard for the Pontchartrain, the Raleigh for the Secor, the Lafayette for the Hollenden. It is a natural mistake. The more you look and the more you listen the more certain you become that you are not in the City of the White House. You feel quite positive that you are in those cities where you hear mostly about differentials, horsepower, revolutions per minute and alloy steels.

Motordom en Masse

Washington has witnessed the migration of motordom en masse. It has within a few months received temporarily or permanently every man of consequence in the automotive industry. You live at one of the big Washington hotels and you are in the motor center. You walk the streets and rub your eyes to make certain you are in the nation's capital and not in Michigan or Ohio. Everywhere are captains of the automotive business, some seeking war orders, some serving the Government, many wearing uniforms, and thinking now in terms of the Boche, army transport, flying and right-about-face instead of carbureters, spark plugs, engines and frames.

John Willys and a huge Overland staff came East to attend the War Camp Recreation meeting. Then came Henry Ford, with Harold Wills, John R. Lee and others of the Ford company, seeking war orders, giving the Government advice, telling how the war should be conducted. Next came Walter Chrysler, Richard Collins and others of the General Motors organization seeking and getting war business. And then came Walter Flanders and many Maxwell men, staying but a few days, returning to Detroit with Government contracts.

The new temporary—for period of war—building for the Council of National Defense

Everywhere in the city in uniform and in civilian clothes you find men of motordom who are here permanently. Just across the plaza from the Union Depot stands the Signal Corps building, where Col. E. A. Deeds of Delco fame holds forth. On Pennsylvania avenue in the Munsey building you find Howard E. Coffin, vice-president of Hudson, first for preparedness, now chairman of the Aircraft Production Board and hard at work with airplane activities. Associated with him is William B. Stout, formerly of MOTOR AGE staff.

On the same floor in another suite is Roy Chapin, also of Super-Six fame, now busily engaged devising schemes for truck transport of supplies, chairman of the Highways Transport Committee and trying to relieve the railroads of a part of their freight troubles.

A few floors below and to the right sits Elliot C. Morse, formerly vice-president of Chalmers, now the Washington representative for the Willys-Overland Co., seeking and obtaining Government orders for Overland and its many subsidiary concerns.

Christian Girl Here

A few blocks to the north on Eye street you find an old red brick building. It was once the home of Secretary Seward of Civil War fame. It has many secret halls and exits, reminders of the perilous times of 1861. To-day you find it occupied by Christian Girl, chairman of the Military Truck Production Board. Mr. Girl, in times of peace president of the Standard Parts Co., enjoys a large suite of offices, efficient and expensive furniture and equipment. Two months ago witnessed him working in the old Seward home before a kitchen table desk under gas light. To-day finds him at an old office desk, the best that could be requisitioned, under electric lights just installed.

That is the situation everywhere in Washington. Men working on matters involving millions of dollars occupy offices worth with full equipment less than $100.

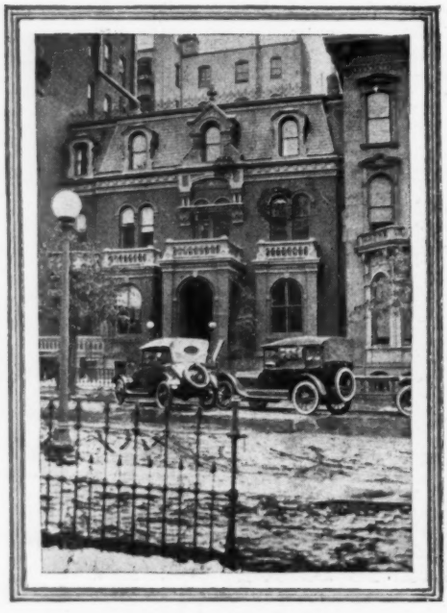
On New York avenue you find Major McG. Wall of the Ordnance department sitting in a small crowded room in a building formerly used as a bachelor hotel, now crowded with desks, one of the most important sections of the Ordnance Corps. For years he has been the engineer for the National company, Indianapolis.

Where Council Works

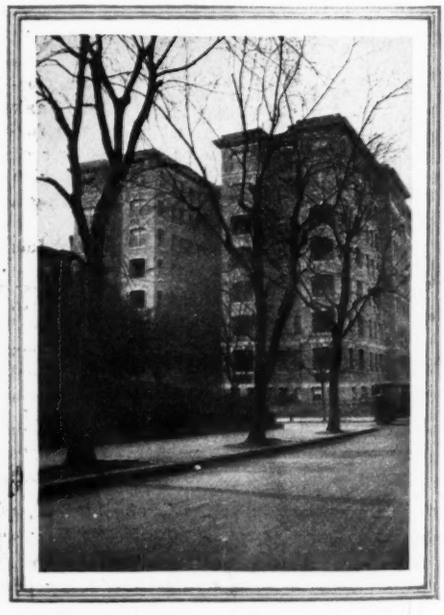
Below the White House on what was formerly a public park is the building of the Council of National Defense, erected for the duration of the war, guarded night and day against fire in its wooden shell, now housing H. L. Horning, member of the War Industries Board for matters automotive, formerly chief engineer of the Waukesha Motors Co., now very busy passing on all purchases made by the Government and the allies of motor cars, trucks, tractors and the like. With him is associated C. F. Clarkson, working overtime as secretary of the Society of Automotive Engineers and also as assistant to Mr. Horning.

In another section of the city is the Automobile Industries Committee, A. W. Copland, Hugh Chalmers and John R. Lee, representing the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers' Association, working for war orders for all makers and also to prevent unnecessary curtailment of the passenger car industry. They have a staff of engineers studying the needs of all Government departments.

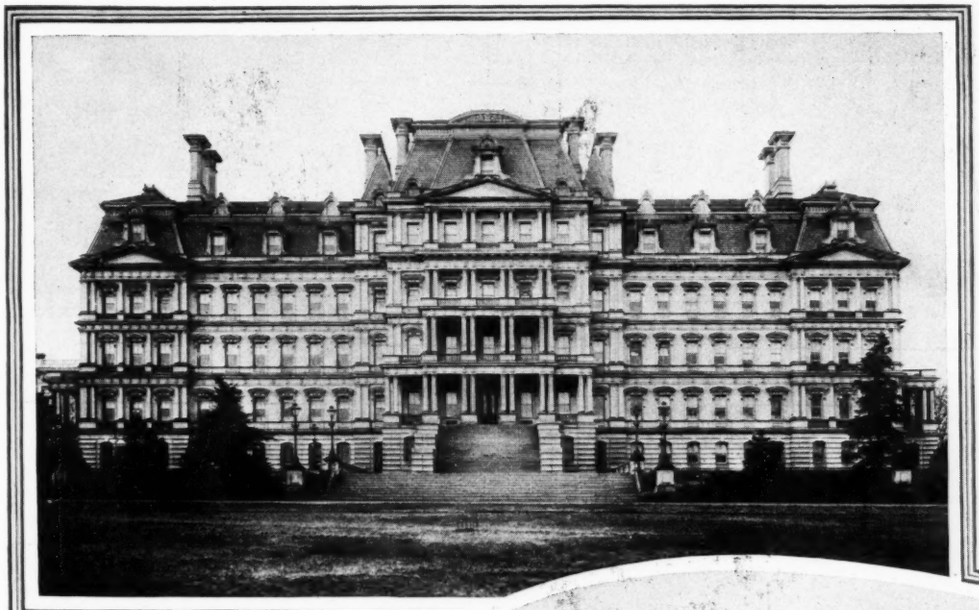
There are many more, too many in fact to

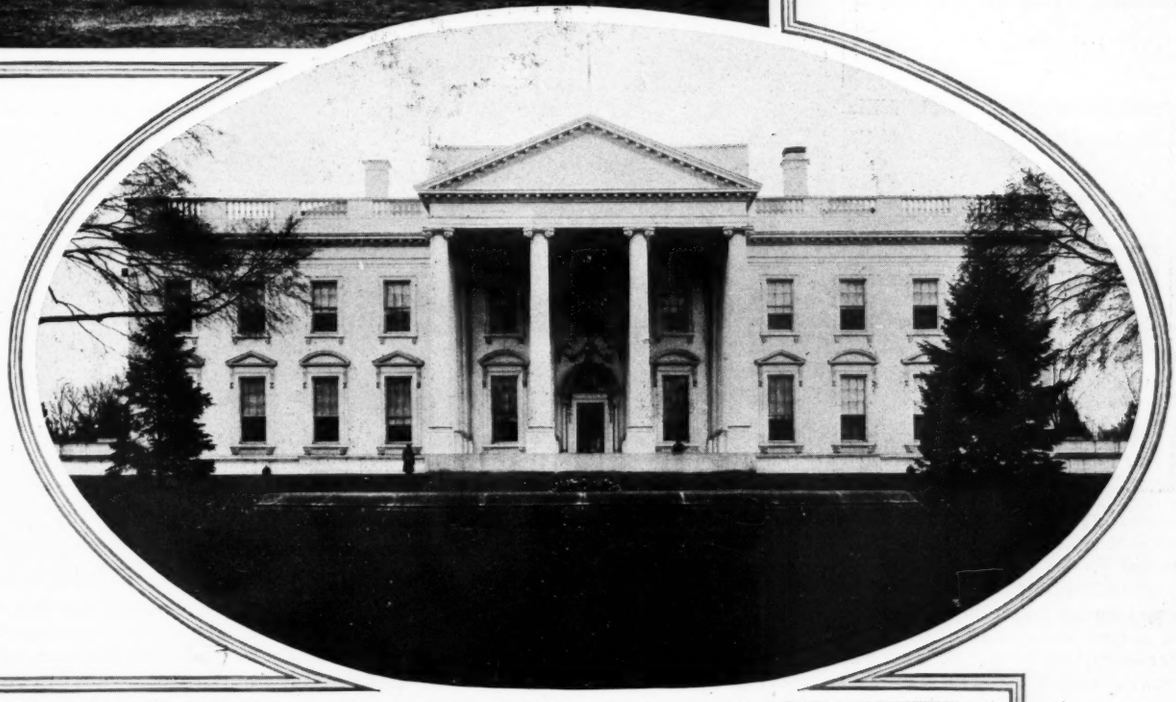


Old home of Secretary Seward of Civil War fame, now the offices of the Military Truck Production Board

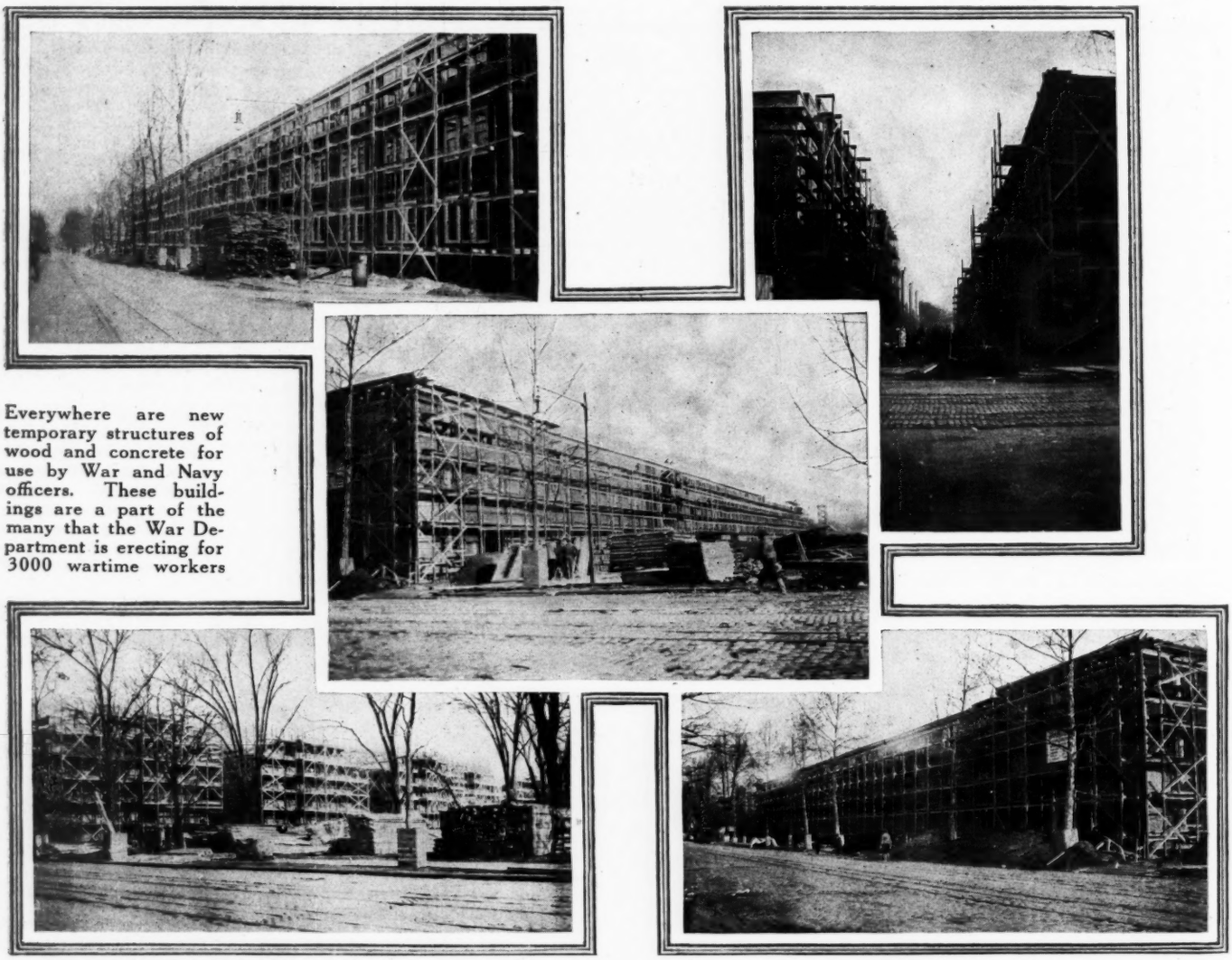


Apartment building not quite completed and seized by the Government for the Quartermaster General





At Washington you find a mighty trinity. At Fifteenth street and Pennsylvania avenue stands the Treasury; at Sixteenth and Pennsylvania the White House, at Seventeenth and Pennsylvania the State, War and Navy building. It is the Chief Executive in the center with the Nation's wealth at his right and the nation's military, naval and diplomatic strength on his left. And from the roof porch of his residence the President can observe the Washington monument, the Capitol Hill, where Congress meets, the Council of National Defense and every important official structure



Everywhere are new temporary structures of wood and concrete for use by War and Navy officers. These buildings are a part of the many that the War Department is erecting for 3000 wartime workers

enumerate, of the men here permanently who until recently were active in the automotive industry. So many that with all the other new citizens of the Capital Washington is enjoying the greatest boom in its history. It is gorged with salesmen seeking war orders for every kind of article. It is filled to overflowing with new Government employees. It is crowded to its limits with foreign officials. Its gates are ripped asunder by the mobs jamming its boundaries beyond the breaking point. Space will not permit mentioning the hundreds of sales and sales engineering representatives that temporarily are located here. Representatives of engine makers, ball bearing concerns, speedometer concerns now looking for aeronautical instrument business, oil companies, airplane makers and, in short, nearly every concern that has work with the hundreds of Government departments. These men now make the rounds of the Washington departments as they used to make the rounds of the Detroit, Flint, Toledo, Cleveland and Indianapolis factories.

Bumper Trainloads

Railroads to Washington, carrying five times the usual passenger quota, operate three and four sections of fifteen to eighteen cars to every usual scheduled train. Upper berths are at a premium. Last minute travelers find no accommodations sitting or sleeping. Hotels are crowded beyond all limits, and often, arriving in Washington, visitors find neither hotel accommodations nor means of getting out of the city to a point where rooms can be obtained.

Dining rooms and restaurants have become gold mines. It is not strange to visit a dozen and find no seats. Guests wait at the Willard, Powhatan, Lafayette, Occidental, Wallis, and even at Ford's, famous for its cosmopolitan crowds, where it is customary to stand and eat, it is often impossible to find standing room. Residents of Washington are reaping the golden harvest from the opportunity. Prices asked would make an Alaskan mining camp blush. Nome in its most glorious days had not the courage to ask Washington prices for food, rooms and apartments. Old residents paying $45 monthly have sublet their apartments for from $150 to $250. Other old residents paying $40 to $100 monthly for rent have been ousted to make way for the newcomers who pay $100 to $500 a month for the same apartments.

New apartment buildings, new motion picture theaters, new hotels, new boarding houses are going up rapidly, feverishly, as everyone strives to create the magnet that will gather in the gold, long foreign to Washington and now so plentiful.

The city that had 350,000 and now has 450,000, with 50,000 daily transients, is witnessing the erection of many temporary and permanent structures. When war was declared, the Government, at a loss for space, commandeered homes, hotels, hospitals and apartments and turned them into war and navy office buildings. The Ordnance Corps, for example, grown from a department with 100 employes to one with 4000 workers, had to take nineteen buildings to house its organization. The Engineering Corps, a small unit in peace times, has grown 1400 per cent and now is spread over every part of the city. The Quartermaster Corps occupies main offices in what was intended for an apartment hotel, which was seized before completion. Many of its branches can be found in other buildings. There are some on Fifteenth street, some on Seventeenth street, some in the State, War and Navy building, many in almost every direction. The War Risk department, handling soldiers' and sailors' insurance, resides in the National Museum, where clerks and desks vie with mummies, paintings and mammoths for space.

All Are Crowded

Everywhere are crowds and crowded conditions. The Fuel Administration, Garfield's famous department, occupies an old hotel on Sixteenth street. The Food Administration under Herbert Hoover is in the same block also, in an old hotel operating under old-fashioned conditions while awaiting the new temporary structure the Government is building.

The War Department, seizing four square

blocks of public parks, is erecting several large temporary buildings to house more than 3000 employees. Every available space has been utilized. The Engineering Corps of the famous war trucks has its rooms in the offices of the Union Depot building. The Depot basement has become the Government garage. The southeastern cellar houses the truck experimental shops.

Committee in Store

An old home on K street is occupied by the War Export board. A small retail store on Seventeenth street holds a committee of the Council of National Defense. An old church on New York avenue is now the Red Cross annex. The Department of Interior building, a new and magnificent structure, has had to give up much space to war committees.

Everywhere is building activity. Temporary structures are springing up on the public parks that again will take on their natural green and have new trees planted in them only after the war is over.

The top floor of the Treasury building is filled with draftsmen working to complete the designs of the different trucks and trailers for the War Department. Office buildings and residences across from and facing the State, War and Navy building have been seized and used for offices for army and navy officials, while from the roofs of all project vast wire arrangements for receiving wireless messages from all parts of the world, taken by operators sitting in sound-proof rooms below and in turn speedily transmitted to the War and Navy departments, the President and the Treasury.

Washington street cars are unable to handle the unusual throngs. The telephone system is in chaos except for Government business, which is handled by the more experienced girls. Telegraph offices frequently announce long delays because of the unprecedented rush of business. The taxicab business, owing to the street car congestion, has grown from insignificance to immense proportions practically in no time. License numbers show an increase of 200 per cent in the number of taxicabs within four months, and all seem busy every hour.

Traffic conditions, at first chaotic, quickly have been righted. Washington, fortunate in its police organization, has been alive to the traffic problems and new policemen, new traffic rules, new traffic signals and various new traffic arrangements have aided to place the handling of traffic on a par with that of the larger cities.

Washington residents unused to the hurry and bustle of the Northerners who now fill the city find their streets and city very different, a bewildering place instead of the former quiet, orderly town that has now become a whirlpool of uniforms, captains of industry, new buildings, army vehicles and wonderful business. To the older residents it is disturbing. To those in business it is an important question of how long the boom will last.

A New Washington

The old well-known souvenir collector is gone. The many brides and grooms who visited here on their honeymoons are no more. In their place you see the keen, earnest individuals called to aid the battle for democracy. Washington has changed and changed much. It is a more interesting city even to its old inhabitants. At every corner and on every street you witness more of interest than is to be found in any other city in the country. Washington, the present home of numerous captains of the automotive industry, the home of the greatest powers of the world, the present center of this globe's activities, the pivot about which civilization itself moves, has for the time being become the busiest, most important and most interesting spot in America. It is wartime Washington, a Washington such as no previous war in this country could bring about, a Washington of the world war.

Department of Interior building, above, where many War and Navy officials work; below, the National Museum, where war clerks sit with desks next to mummies, mammoths, statuary and valuable paintings

Above you see one of the new apartment houses. Old bachelor hotel, oval, on New York avenue, now used for offices by the Ordnance department. New food administration building, shown below

Hard Driving in France

This article is the second of a series written by a young American who drove an ambulance in France from Feb. 22 to Sept. 1 of last year. The picture above is of a centralized dressing station, half a mile from the front trenches. To reach the dressing station one must enter where the sand bags bar the doorway at the left, where the soldiers stand. Back of the stone wall are accommodations for forty stretcher cases and a regulation corps of doctors who do bandage work is in attendance. Front line dressing stations generally are located in such caves as this, where the stretcher cases are free from shell fire from enemy guns

By Robert A. Drake

"A DOLLAR a gallon—and I just lost half a quart on the ground!" I squirmed out from under my ambulance, dragging after me a canvas bucket filled with gasoline. "But the flivvers must be fed in Mobile—and there isn't any more gas in the Section."

It was the morning before a convoy, and every ambulance driver in camp was tuning up his car greasing, oiling and rattling the levers to loosen up the gearshift. The right side of my ambulance was covered with oil that had been thrown up from the wheel, and my grimy hands and greasy overalls were the result of 6 hr. work removing the wheel and adjusting the felt washers around the rear axle.

The Usual Chant

By 4 o'clock in the afternoon we had begun the usual chant of complaints about the loads in our cars. The fifty odd spare tires of the Section, the large tents and the office furniture were but part of the material that had to be piled in the cars when the whole camp moved a long distance.

"Ducky, I can't possibly carry all these extra stretchers!" Petey said. "My right spring is weak now, and it will break before I get out of the yard if I pile in all that junk!"

"Who wished this 'coffin' off on to me?" Jonesey stood pointing at the huge bass viol that belonged to the division band.

"Oh well, you should worry. That's light!" Rip answered. "Come on, quit your crabbing and get in on this pool!" He was going around collecting a quarter from each man and giving in exchange a slip of paper with a number written on it.

"That's the number of Ignatz Ragsdale's car," he said as Bill drew a slip of paper. "If Ignatz's car is the first to break down tomorrow, you win this hatful of money."

"Oh, come on, get in on this Ford pool!" Circus joined the crowd with a new bunch of numbered slips. "Everybody bets on his own car, and if you think you can catch up with the convoy again, drop out any old time and win the money!"

Early the next morning I had orders to start ahead of the convoy to carry the office furniture, but this commission, coveted because it was dustless, and dustless because the car did not have to follow twenty others immediately ahead of it, failed to materialize at the last minute.

By 6 o'clock Chef Michael had given all of us a half loaf of bread and a piece of cheese to tide us over until dinner time, and the convoy was just getting ready to start when the sun broke out from behind the morning clouds and spread a golden glow over the wheat fields. There was a gleam of frost on the ground, and a patch of snow here and there. The atmosphere was so chilly that we found considerable difficulty starting our cold engines. The night before Ducky had made each man drain the water from his engine so that the water would not freeze and break the metal, so now a bucket brigade formed to refill the radiators.

When I had filled my car I began the complicated procedure of trying to persuade forty-eight cold, motionless horses to come to warm, powerful life! I cranked a minute before I remembered to turn on the gasoline. Then it occurred to me to pump up the gasoline pressure and to tickle the carbureter, but still the engine did not start. The electric starter made a rattling noise like an American egg beater, but it did not turn the engine over fast enough to start the explosions.

When Priming Failed

"Prime it with gasoline," Wally suggested. "There's a bottle lying on Bill's running board."

So I poured some of the clear liquid into each of the cylinders. Fifteen more long minutes passed, and at the end of that time I was wet through with perspiration and filled with the peculiar anger that man can feel towards the hopeless apathy of a stubborn engine.

"Ducky, this cussed car won't start!" I finally made an appeal to the leader.

"What's wrong here?" Ducky answered as he climbed into the seat and then climbed to readjust the mechanisms. "Switch on? Gas up? Carbureter choked?"

"Yes, yes, yes!"

"Crank her up!"

Splut-t-t-t-t-er! A few wheezy explosions came from the engine—then it stopped again.

"She sounds as if she was full of water!" Ducky said. "Did you prime it?"

"Yes, with Bill's gasoline!"

"My gasoline? That bottle you've got there is nothing but water!" Bill had just walked up. "No wonder you couldn't start your engine!"

But in another moment Ducky had the engine running sweetly, and as the leader, flicking a few specks of dirt from his coat, walked away, Bill remarked, "That's Ducky all over. I spend hours cranking my car and then give it up as a bad job. But just as soon as I call Ducky he starts the engine on the first crank! That hasn't happened only once but hundreds of times. He's got a regular reputation for doing the trick!"

Meanwhile, several of the Ford drivers also were having trouble starting their engines. The sudden roar of an engine and a shout "Whoa, Maud!" made me turn around. Petey's Ford was running away. The engine had started unexpectedly, and Petey now was bracing himself against the radiator trying vainly to hold back the obstreperous vehicle.

Could Not Be Coaxed

Jonesey's Ford refused all ordinary coaxing, and as the time for departure was near, Ducky tied a tow rope from the small car to a larger ambulance, and ran up and down the street until the engine began to splutter.

Pfs-s-st! Ducky's sharp whistle broke up the chatting groups of men. Everyone ran to the side of his ambulance and held up his right arm to show that his engine was running. Then the cavalcade started up, but the whole convoy stopped again just outside the limits of the town, so that the leader could make sure that all the cars were in line.

The first day of the convoy was cold and disagreeable. The cars slipped and skidded on the greasy road as the wheels spun madly around trying to get traction, but the long overhang on the Ford bodies made them slide into the ditch continually.

"We're going like a bat out of h——l!" Wally remarked after a few minutes on the road. "The fellow who is leading this convoy is going too fast for our big car—to say nothing of the poor Fords. Ah, I thought so!"

The convoy rolled by four Fords drawn up beside the road, each one with its engine thumping loudly.

"Bearings burned out, or else the connecting rods gone!" I yelled. "Ducky is going to be sore; I wonder where he is."

By this time the snow and sleet had begun to drive straight into our faces, as the cars had no windshields that extended more than a foot above the dashboards. Neither Wally nor I had any goggles to protect our eyes, so driving was more by instinct than by sight.

"I'm going to get some goggles the first chance I have; that's all!" Wally said, and when the convoy stopped for a few minutes in a small country town, both he and I bought some glasses.

"Heard the news?" Pap Marcel asked as he wandered up to the car.

"No."

"Ducky is lost, and the motor truck kitchen is broken down 10 miles back. We've lost the road ourselves, and if we get to Palais by midnight, we'll be lucky!"

"D——n this life anyway—hey! Look—it!" Wally gazed intently down the street. Two little French girls were standing on the street corner, casting coquettish glances toward the Americans.

"Let's go over—" To-o-o-t! The starting whistle interrupted Wally's new formed plan, and he had to turn his back to the petites demoiselles to run back to the ambulance.

"'If sympathy is akin to love, I'm nearer to you than your own mother!'" I quoted from the seat of the car. "Crank her up, old woman hater! C'est le guerre!"

Again the convoy started up, but for some reason stopped so quickly again that two of the Fords telescoped the cars ahead of them, smashing the glass in the headlights and puncturing the radiators.

"See?" Wally said. "Every time we start out on a convoy after a long rest, half the men have forgotten how to drive and we have these smash ups. If we were just coming down from the front instead of going up, we wouldn't have any trouble at all."

"I'd rather drive through the worst sort of traffic at the front than trail along in convoy!" Wally said. "We're driving through mud, but just wait till to-morrow! I'll bet you we'll have some dust!"

And sure enough, the next day, when all the lost members of the Section had been found, 2 in. of dust as fine as white flour covered the road. After only half an hour's run the dust accumulated on our faces had made our skin a ghastly white.

Then plop! One of my rear tires blew out, and I stopped my car on the right side of the road to let the rest of the ambulances pass. The two mechanics from the repair shop helped us make a quick change, and 10 min. after the puncture I left the truck behind to speed after the vanished convoy. I caught up with the other cars after a fast drive of 8 miles and slipped into the gap of the line that Rover Center had left.

Troubles in a Row

The next day I had carbureter trouble for 7 miles at the beginning of the convoy, but a quick readjustment of the choker at the first stop put '69 on her feet again. The ambulance with its heavy load of trunks and stretchers, climbed the 2-mile hill outside of Château Thierry on high gear just to show her worth. The dust was now so thick that we looked like animated stone statues.

"Take a look at this engine!" Wally had lifted up the hood of the engine he had polished and wiped only a few hours before. The oil that had spattered all over the cylinders during the trip had caught all the dust to make a thick cheesy mixture about the color of a hornet's nest.

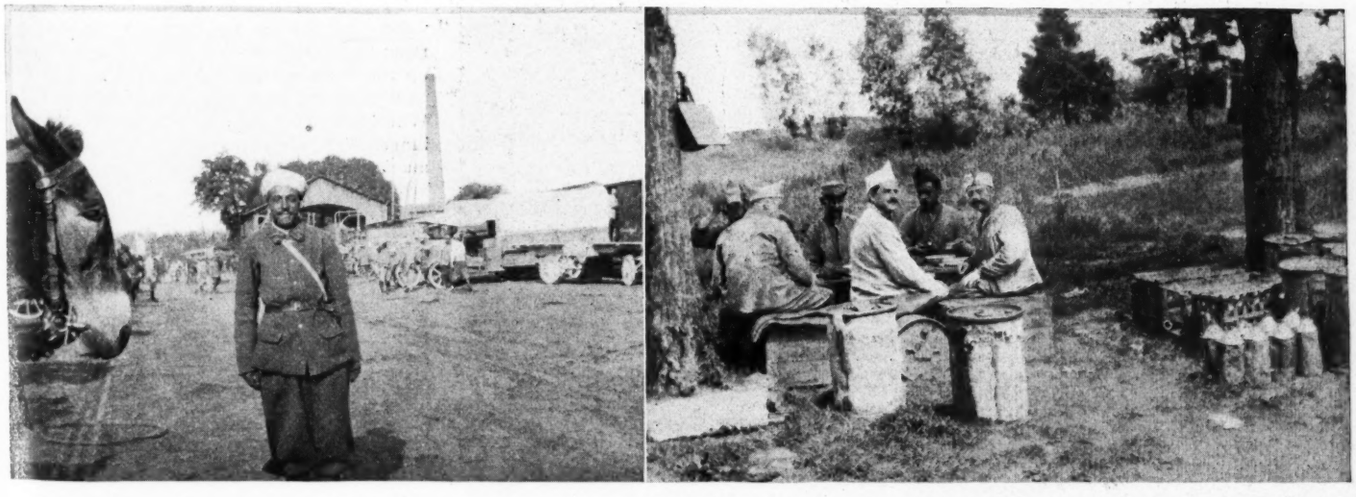
"This is a great life," I remarked wearily—"If you don't weaken! Probably we'll have an inspection to-morrow morning and have to clean this engine all up again!"

"Well, they say we only get a call once in three days here, so we'll have time enough," Wally answered. "I wonder if I'll ever get any 'pep' to wash up?"

"No time to wash now!" Ducky walked up to the boys. "You're one of six cars to leave at once for Vailly. Crank her up!"

It was 7 o'clock when six large ambulances started out but only an hour later they returned to camp again.

"Mix-up in orders—head doctor made



Provisions and munitions are brought up to 5 miles back of the front line trenches by train and moved by trucks to the front. Such a railhead is at the left, with a teamster from Morocco, Africa, in the foreground. An outside storage room for ambulance service is at the right. Note the fire extinguishers. French mechanics with the Red Cross are seated at lunch

a mistake,'' I explained briefly to the expectant crowd. ''It's the first time this has happened since I've been in the Section, though—and that speaks pretty well for the efficiency of the French army. And it was a lucky trip for me, too. Look!'' And I pulled a limp, scrawny fowl from the seat. ''Chicken dinner to-night, boys! I ran over this critter a mile up the road and got the remains for only a dollar. If I'd bought a regular hen it would have cost me two bucks! German efficiency, I call it!''

The next day Joe Wilson tried to discover whether his Ford ambulance was tougher than an enormous truck, but the camion won the duel. It only had a scratch on its body compared to the bent front axle, broken lights and warped wishbone rod of the Ford. And the same afternoon Jonesey copied Joe Wilson; he ran into a 10-ton meat truck.

''Let's change lamps with that old canvas back Ford before Ducky sees the damage,'' Jonesey said, but his ruse was unsuccessful.

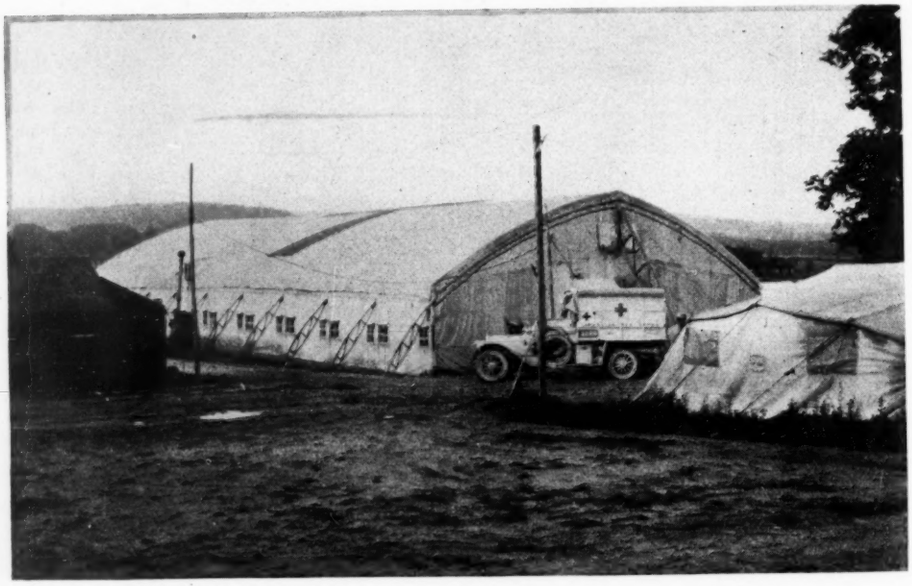
''Had an accident, I see!'' Ducky's eagle eye spotted the accident at once. ''Your wheels are out of line! I'd much rather you would come and tell me after you tried to bump a camion out of the road. It will save you trouble and me too, for I'll find out about it anyway.''

At the end of every convoy the cars had to be lined up beside each other so the front of the ambulances were all on a straight line. This procedure was easy for the Ford drivers to accomplish because the cars were all of the same size, but it was more difficult for the Packard drivers because there were at least seven different models and sizes.

''Come on! Come on!'' Dufour, the fat, officious clerk of the Section, said. ''Get your headlights in line! Come up farther! Stop right here!'' He thrust his foot out 4 in. ahead of the front wheels.

''All right!'' I answered. Just as you say!'' and I ran the tire of my 2-ton ambulance right on top of Dufour's dainty French toes.

Nearer the front it was not possible for the cars to be parked in a line. Every driver backed his ambulance under the thick foliage of the nearest tree, for if they stood out in the open, the German airplanes could see their conspicuous canvas tops.



Typical field hospital of the best type used by American units, 6 or 7 miles from the front. As many as sixty-six ambulances deliver wounded to such a hospital. The large tent is collapsible. This hospital was bombed three times in one day by the Germans in July and several of the patients were killed in the raid

Athletic encounters of all kinds are staged 15 miles back of the front line trenches. Here the star performer is lifting a comrade in a sack by his teeth. Sunday afternoons usually are spent in this way by soldiers from the trenches

Washing Up

''Come on, Wally!'' I said as soon as I had filled '69 with oil and gasoline after the long run. ''Let's get ahead of the crowd and get the car washed.''

We drove the ambulance to the bank of a little stream that ran through the forest and spent the rest of the morning and most of the afternoon freezing our hands in a vain attempt to loosen the caked mud. Soon more of the cars came down to the stream, and still others clustered around the stone fountain in the square of the little town. The ground in this plaza became a quagmire of mud in a few minutes.

When two French soldiers offered to wash the ambulances inside and out for a dollar apiece, almost everyone stopped work to wait their turn. These two progressive cavalry men in one afternoon earned more than they received in three months from the army. But we had almost finished cleaning our car, so we decided to finish up the work ourselves. We began the hardest task of all, scrubbing off the blood stains from the floor and springs. It was the hardest task, not so much because the sight of human blood was repulsive—we had both seen enough war to be quite accustomed to the crimson spots—but rather because the blood rusted the metal so quickly and stained the wood so deeply.

The true aftermath of the convoy began when the drivers got out the paint cans from the repair truck. They tried to cover up the worn surface of the bodies, but the new shade of gray never matched the old. When the painting was finished, the ambulances were a mottled color that offered as much protection as the war paint on the army locomotives.

Between Showers

Then there were magnetos that had to be covered with cloth to keep them out of the rain. Manifolds and carbureters had to be removed from the engine of '69, but every time I had my hands full of greasy tools and disconnected rods, a sudden shower soaked me to the skin before I could unload my burden. I ran indoors but was hardly on the threshold before the rain stopped and the bright rays of the sun enticed me out to make another attempt to work. But just as I got both hands full of screws again, another shower broke up the proceeding.

Just as the convoy from Couvrelles was

coming to an end, a sudden ripping of metal and a quick jerk of the car told me something was wrong. The rear wheels refused to turn, and the French mechanics and American drivers had to work together for 5 hr. removing bits of broken metal from the rear end of the car before '69 even consented to be towed. As this was the very first day of repose after two weeks of hard work at the front, I considered the accident lucky in more ways than one.

In the Section it was a disgrace if a man had his car break down—drop out of the race was the expression for it—while the ambulances were driving under shell fire, for every car that was not in running order made the work just so much harder for the few left. Then, too, if the old fracture in the metal of that gear had broken on the dangerously shelled road to Ostel, the situation would not have been pleasant.

"Imagine spending 5 hr. underneath the car with the shells shrieking around!" Wally said in a worried tone. "We're in luck, that's all!"

The Repairing Job

The greatest difficulty of driving was the repairing of the cars after the day's work. We came into camp tired out by 24 hr. in continuous service, with the realization that 3 or 4 hr. of hard work was necessary for pepping up the cars. But I found the best plan was to begin the repairs immediately on the arrival from the front, for if I laid down for only a few minutes, I felt too tired to get up again. The more repairs I had to do on the car, the more I felt like doing them if I began immediately, and vice versa, the less I had to do the harder it was for me to do it.

Some days when three-quarters of an hour would have sufficed to complete the work, we spent all afternoon trying to get out of bed. On other days we donned our overalls immediately on our return to camp, changed tires and broken springs, tightened up loose rods, one repair after another as fast as I checked them off on the list I had jotted down. The articulations had to be cleaned in a bath of gasoline, and the radiator removed to repair a leak that a fragment of shell had punctured in the copper waterjackets.

The elaborate electrical equipment on the large ambulances gave the driver more comfort when they were in working order, but they caused me many hours of work to keep the intricate mechanism in repair. As soon as we became accustomed to our cars the repairs became easier to do, but on special occasions I still lost my temper in this process of pepping her up.

One day I had worked feverishly for many hours to complete a patent new top to keep out the rain from the front of the car. My hands were pricked and blistered from attempts to sew the tough cloth, but I had to go up to the front on duty only an hour after I finished my work. Just as I arrived at the front dressing station, the Germans began to drop shells into the town with such accuracy that the shell fragments punctured the new top in six different places.

"I used to think I hated the Boches!" I exclaimed bitterly when I came out from the dug-out and viewed the ruins of my top. "That feeling I had was love compared to the **way I feel now!"**

Almost every car in the Section was so old and worn that the secrets of starting the engine and keeping it running were known only to the driver. I, for example, knew that I should crank my engine for three revolutions before I turned on electricity; if I turned the engine over four times instead of three the engine would refuse to start until I had spent 15 min. blowing the extra gas out of the cylinders.

Because the cars were so cranky, an unwritten rule in the Section said, "Each man stick to his own car. Nobody else to drive another man's ambulance except in case of necessity!"

Instead of causing trouble, these little tricks of each car gave the inanimate mechanism an individuality that endeared it to the heart of its driver. Each of us competed for the honor of having the most reliable car in the Section, and this competition in the upkeep of the cars kept up the standard of uninterrupted service more than any other one thing. Every man took a personal pride in his ambulance.

When we were carrying wounded on the roads, there were many traffic troubles, but the policemen, distinguished by green and white bands tied around their left arms, directed the teams and motors very well under the circumstances. As these officers had specific orders to shoot any driver that refused to obey their commands, we took good care to throw on our brakes when we saw the uplifted hand and heard the words "Slow up!"

Numerous signs that read "Guarded route" and "Forbidden to Pass" made it necessary for us to ask permission from the policemen before we dared drive by even the slowest of trucks.

"What are these red disks on the back of some of the teams?" Wally asked a policeman one day.

"The last car of every group of [illegible] fifteen teams has a red target like that," was the answer. "The driver of the first team of the convoy following is supposed to leave a gap of 25 yd. to make the whole line of traffic more flexible."

A placard with the word "Circulation Hippomobile" had often aroused our curiosity.

"Hippomobiles must be those big elephants of steam trucks we saw in Paris," Wally conjectured. "Probably they are so heavy that they break up the surface of the road, so they keep them off this route. Let's ask the gendarme about them."

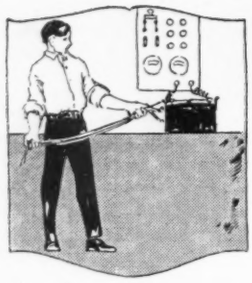
"Hippomobile?" the guard said when the car stopped beside him. "That means any kind of light horse traffic—the small stuff! This road is reserved for motors and heavy trucks exclusively!"

Road Service Signs

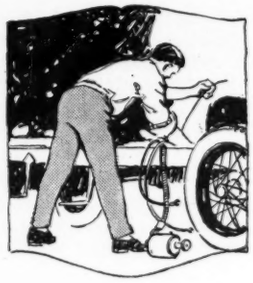
On all the cross-roads within 6 miles of the front I noticed the new signs of the road service of the army. They were large sign boards with large conspicuous red letters, and they often stood in striking contrast to the sign posts of peace times. The ugly, efficient boards took the place of the small and artistically lettered metal notices.

When the troops began to move on the roads, the traffic troubles began to increase. On trains, in trucks and on foot the soldiers passed, accompanied by ammunition wagons, guns, supply trains and pontoon bridges. After one day's run Wally counted 160 trucks of one make parked in the square of Château Thierry, and they were only a small part of the number that had brought the troops into town that day. Big guns often trailed along behind these trucks, rattling and clanking so loudly it was next to impossible for any horn to be heard above the noise.

At the left is an ambulance which suffered a direct shell hit. The driver was killed instantly. The ambulance was photographed at the repair depot after being dragged 5 miles with the front end supported on rollers. A group of American college boys, with a French mechanic, is shown at the right. They were all in the ambulance service



Electrical Equipment of the Motor Car



By David Penn Moreton & Darwin S. Hatch.

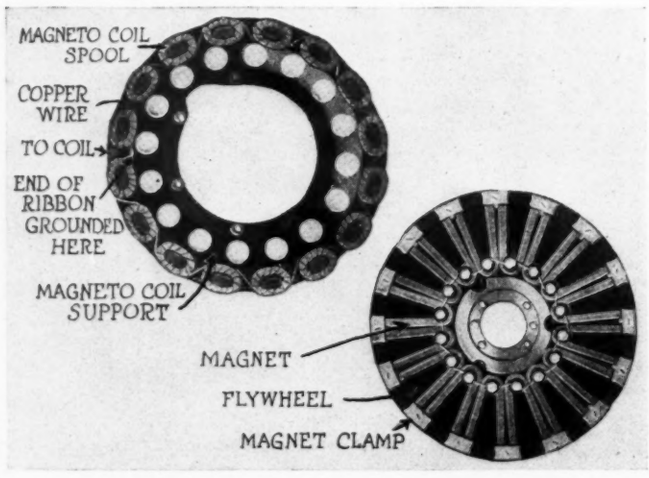
Editor's Note—Herewith is presented the seventy-eighth installment of a weekly series of articles begun in MOTOR AGE. *issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York, in a size to fit the pocket conveniently.*

Part LXXVIII—Ford Ignition and Lighting System

THE ignition and lighting system used on the Ford car as standard equipment is decidedly different from any other system now in use and it is deserving of a thorough description on account of the many systems in service.

Electrical energy is obtained from a specially constructed magneto, which consists of sixteen coils of flat copper ribbon wound around sixteen equally spaced iron cores, which are mounted on a special structure bolted to the transmission case directly in front of the flywheel. Sixteen small permanent horseshoe magnets are mounted on the front face of the flywheel, and just enough clearance is allowed between the pole-pieces of these permanent magnets and the iron cores about which the copper coils are wound to prevent them from striking when the flywheel is caused to rotate. The coils and their mounting are shown in Fig. 432. The sixteen magnets and the method of mounting them is shown in Fig. 433. The magnets are so placed relative to each other that adjacent ends are of the same magnetic polarity, and these two ends are joined magnetically, so as to form a single magnetic pole, by a clamp of magnetic material. There are then sixteen magnetic poles around the outer edge of the flywheel, and these poles are alternately of north and south magnetic polarity.

When the magneto is assembled and the magnetic poles are directly opposite the iron core of the coils, there will be magnetic lines of force across the gap between the poles and the iron cores, and the direction of these lines of magnetic force will be from the north magnetic poles across the gap, through the iron core under the north poles, through the structure supporting the iron cores to the cores under the south poles of the magnets, up through these cores across the air gap to the south magnetic poles, thence through the magnets to the north magnetic poles, which completes the magnetic circuit or path of the lines of magnetic force. With the magnetic poles directly opposite the iron cores of the coils, there is a maximum number of lines of magnetic force through the coils, since the magnetic circuit with the various parts in this relation to each other offer a minimum opposition to the production of lines of force. The direction of the lines of force through eight of the coils will be from the north magnetic poles on the permanent magnets through the coils toward the support for the iron cores, and the direction of the lines of magnetic force through the remaining eight coils will be from the support for the iron cores toward the south magnetic poles on the permanent magnets. Now, if the magnetic poles be moved so that they are midway between the iron cores, there will be a minimum number of magnetic lines through the coils as this position of the magnets and the iron cores offers a maximum opposition to the production of lines of force. If the magnetic poles be moved farther on so that they are again opposite the iron cores, the magnetic lines through the coils will again have a maximum value. The direction of the magnetic lines through the coils in this last position will be in just the reverse direction to what it was in the first position, since the north magnetic poles are now opposite iron cores, which originally had south magnetic poles opposite them, and south magnetic poles are now opposite iron cores which originally had north magnetic poles opposite them.



Figs. 432 and 433—Stationary coils of Ford magneto mounted on metal coil support, left, and permanent horseshoe magnets mounted on front face of flywheel

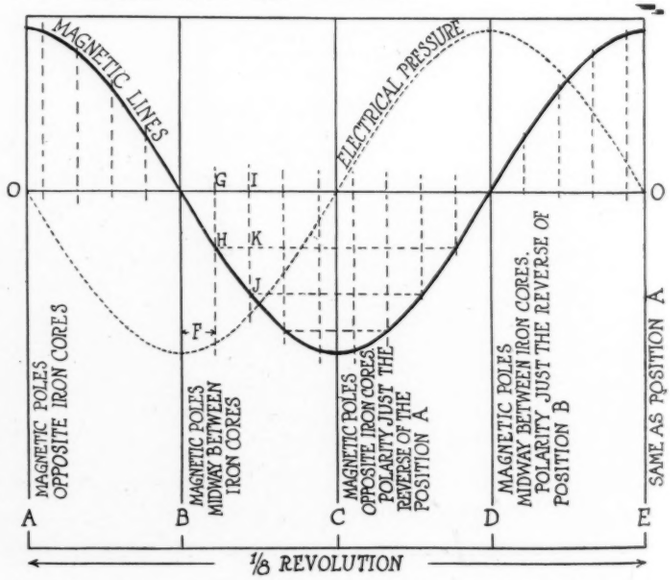


Fig. 434—Variation in magnetic lines through coils for different positions of magnetic poles with reference to iron cores on which coils are wound

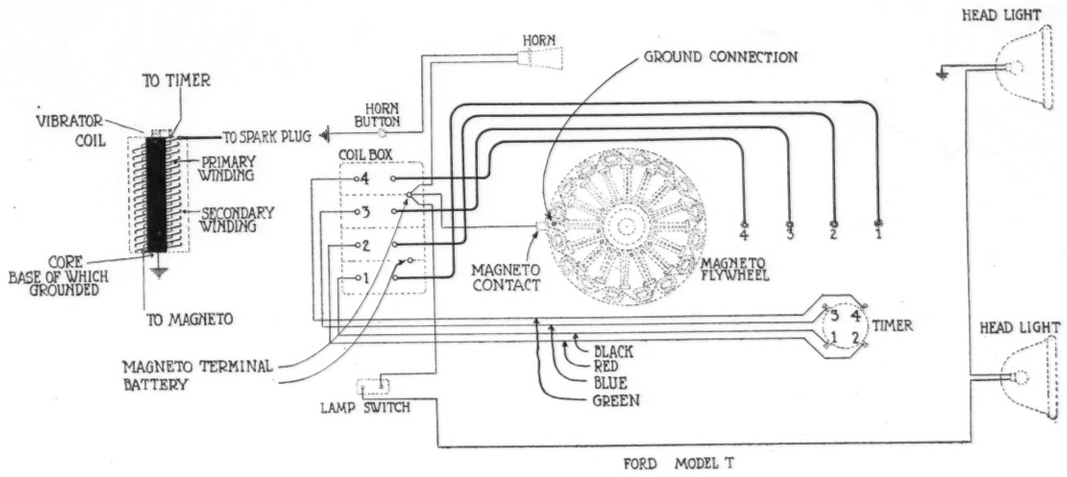


Fig. 435—Wiring diagram of standard equipment on a Ford

If the magnetic poles be advanced another sixteenth of a revolution, the polarity of the magnetic poles and iron cores will be the same as at the beginning. Hence, the magnetic lines through any particular coil pass from a maximum value in one direction through the coil to zero value, build up to an equal maximum value in the opposite direction through the coil, then to zero value and increase to a maximum value in the same direction as it originally had, while the magnetic poles are moving from a position directly opposite the iron cores through an eighth of a revolution. The variation in the value of the number of magnetic lines through the coils for different positions for an eighth of a revolution is shown in Fig. 434. The distance of the heavy curve marked magnetic lines above or below the horizontal line 00 is a representative of the value of the number of magnetic lines through the coils for the different positions. Thus for position marked A the magnetic poles are opposite the iron cores and the value of the magnetic lines is a maximum. For position B the magnetic poles are midway between the iron cores, and the value of the magnetic lines through the coils is zero. For position C the magnetic poles are again opposite the iron cores, but the polarity of the magnetic poles in relation to the iron cores is just the reverse of what it was for position H, and, hence, the value of the magnetic lines through the coils will leave a maximum value for position A. The magnetic lines through the coils are zero in value for position D and again reach their original maximum value for position E.

As a result of the magnetic lines of force through the cores changing in value an electrical pressure will be generated in the different coils, and the direction of the generated pressure in adjacent coils will be in the opposite direction around the coils, since the magnetic lines pass through adjacent coils in opposite directions. The coils, however, are so connected that the electrical pressures all act in the same direction and the total electrical pressure between the terminals of the magnets at any instant is equal to the sum of the electrical pressures in the sixteen coils. The value of the electrical pressure in each coil at any instant will depend upon the number of turns in the coil and the rapidity with which the magnetic lines through the coil are changing. An inspection of the curve in Fig. 434, which showns the variation in the magnetic lines through the coils for different positions, will show that the electrical pressure is zero when the magnetic lines are a maximum and that the electrical pressure is at a maximum when the magnetic lines through the coils are equal to zero, etc. These results can be explained as follows: Suppose we take a small part of revolution, such as 1/144th, as shown at F in the figure. For this small part of a revolution, the magnetic lines increase in value from zero to GH. For the next 1/144th, of a revolution they increase in value from GH to IJ, or the net increase is KJ. It is thus seen that the net increase in magnetic lines is growing less for each 1/144th of a revolution, until the magnetic lines through the coils have reached their maximum value when the net increase is zero.

As the magnetic lines through the coils decrease in value, the rapidity with which they are changing in number increases until the lines through the coils are equal to zero, when the rapidity of their change in number reaches its maximum value and then starts to decrease and again becomes zero when the lines through the coils have reached their maximum value. As a result of this varying rapidity with which the lines through the coils are changing, a varying electrical pressure will be produced in the coils. The induced electrical pressure may be represented by a curve having the form of the dotted curve, in Fig. 434. The electrical pressure produced in the coils while the magnetic lines are decreasing in value in one direction through the coils will be in the same direction as the electrical pressure produced in the coils while the magnetic lines are increasing in value through the coils in the opposite direction.

Such a pressure as the one shown in Fig. 434 is called an alternating pressure, because it is first in one direction and then in the other. AH values of electrical pressure, represented above the horizontal line 00, are considered positive and all values below the line are considered negative. A complete system of positive or negative values is called an alternation, and the complete alteration constitutes what is called a cycle. In the Ford magneto there are sixteen alterations per revolution and eight cycles per revolution. If this alternating pressure is connected in a closed electrical circuit, it will produce an alternating current in the circuit and the current will complete the same number of cycles in a given time as the electrical pressure completes. The number of cycles the electrical pressure and current complete in a second is called the frequency of the pressure and current. The frequency of the electrical pressure developed by the Ford magneto will be equal to eight times the number of revolutions of the flywheel in a second.

Magneto Terminal Connections

One terminal of the circuit formed by connecting all the sixteen coils in series is grounded permanently by connecting it to the metal support for the iron cores, which in turn is bolted to the transmission case. The remaining terminal is connected to an insulated binding post mounted on top of the transmission case. The terminals of the magneto, then, are the insulated binding post and the ground connection.

Ignition System

The ignition for the Ford car is taken care of by a four-unit induction coil mounted on the dash and so arranged that energy may be supplied to its primary winding from either of two sources, depending upon the position of the ignition switch. The only source of electrical energy provided by the manufacturers of the car is the magneto, but a battery connection is provided in the coil box and may be used merely by grounding one terminal of the battery and connecting the other terminal to the binding post on the coil box.

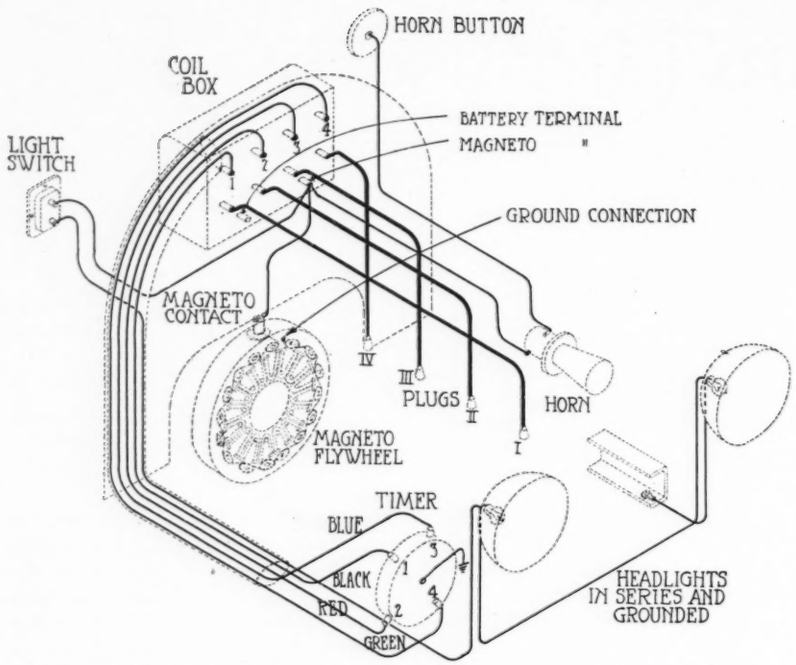


Fig. 436—Perspective view of wiring and component parts of Ford standard electrical equipment

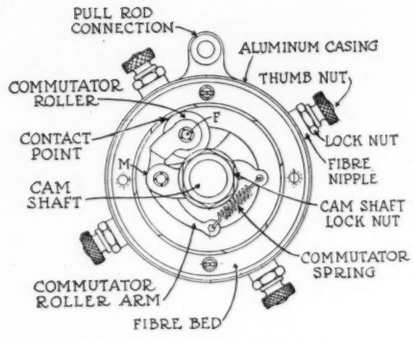


Fig. 437—Interior of Ford timer

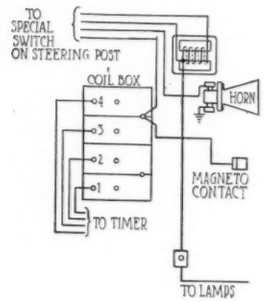


Fig. 438—Connections of special dimmer and leads to special switch on steering post

A wiring diagram of the lighting and ignition system supplied as standard equipment on the Ford car is shown in Fig. 435, and the relative location of all the different parts, together with their various electrical connections, is shown in Fig. 436. The four primary ignition circuits may be traced as follows: Starting with the magneto contact, along the insulated wire to the magneto terminal on the coil box, then to the magneto contact on the switch on the front of the coil box, and when this switch is closed on the magneto, all the primary windings are connected to the magneto contact but the circuit through these various windings are closed one at a time and in a definite order by the commutator, or timer, which grounds the different wires as the roller contact in the timer makes contact with the terminals to which the different wires are connected. The interior construction of the timer is shown in Fig. 437. When a battery has one terminal grounded and the other terminal connected to the battery terminal on the coil box and the switch on the front of the coil is thrown in the position marked battery, the battery replaces the magneto as a source of electrical energy and all the other operations remain the same.

A vibrator is connected in series with each of the primary windings, and when any one of the primary wires leading to the timer is grounded the vibrator in that particular primary circuit will vibrate as long as the circuit is closed, which will cause a high voltage to be induced in the secondary windings surrounding the primary winding of the induction coil. One terminal of each of the four secondary windings is grounded, and the remaining four terminals are connected to the four spark plugs by suitable lengths of high-tension wire, as shown in Figs. 435 and 436. The primary wires leading from the induction coil to the timer are marked with colored threads as shown in Figs. 435 and 436.

Lighting Circuit

The lighting circuit for the headlights may be traced as follows: From the magneto contact to the magneto terminal on the coil box, then to the lamp switch on the dash, through the switch when it is closed, then to the right-hand headlight and through the bulb, then to the left-hand headlight and through the bulb, then to ground and through the winding of the magneto to the magneto contact which completes the circuit. The two headlight bulbs are in series and if they are alike, approximately half of the electrical pressure generated in the winding of the magneto will act on each of the lamps, the remainder being used in overcoming the resistance of the winding of the magneto, the resistance of the connecting wires, ground connections, switch contact resistance, etc.

Horn Circuit

The horn circuit may be traced from the magneto contact to the magneto terminal on the coil box, then to the horn, through the horn to the horn button mounted on the steering post, through the horn button when it is closed to ground, through the winding of the magneto to the magneto contact which completes the circuit.

Combination Switch and Dimmers

The Ford company is equipping its cars now with a combination horn and light switch, which is mounted on the steering column and has very much the same general appearance as the horn button except the switch is longer to provide the necessary space for the various additional contacts and terminals. In addition to the combination horn and light switch, the Ford company is providing a means of dimming of the headlights. The dimmer consists of a coil of wire wound about a laminated iron core and so arranged that it may be connected in series with the headlights by a special switch on the steering post.

The special switch is so constructed that a small pressure on its rounded top closes the horn circuit and a small rotation from its normal position connects the lamps to the magneto with the dimmer coil in circuit and a further slight rotation connects the lamps directly to the magneto. The electrical connections of this special switch are shown diagrammatically in Fig. 438. Pressing the switch connects wires A and B, rotating the switch to the second position connects wires A and D and rotating it to the third position connects wires A and C. The light circuit is entirely open with the switch in the first position. When the switch is in the second position and the wires A and D are connected, the winding on the dimmer is connected in series with the lamps. The action of this coil is dependent upon a combination of the resistance of the coil and a property of the coil called its inductance. The effect of the inductance of the coil depends upon the frequency of the current in its windings, and this effect increases with an increase in frequency and decreases with the decrease in frequency.

The Motor Car Repair Shop

Trouble in Generator and Regulator and How to Locate It

IN the issue of Jan. 3 the location of trouble in the starting motor and a method for the rapid location of grounds were considered for a certain type of electrical system. In continuation of this the case of the generator failing to charge properly will be taken up, the generator being a separate machine with demountable regulator attached directly to the generator.

Provided the generator fails to charge properly, remove the polarity reversing switch at the regulator and with a voltmeter ascertain if the full battery voltage is across both contacts of the switch. The voltage at these contacts should be the same as the battery voltage and if so, this indicates that the generator output is being delivered to the battery. In case the voltmeter reading is less than the battery voltage, then examine the battery for loose or sulphated battery terminals. Also at this time make sure that the battery terminal screws are not bottoming in the thread of the terminal. If the battery terminals prove to be in good shape then examine the ammeter connections on the reverse side of the dash and be certain that these are tight and clean. However, if it is still impossible to obtain the proper battery voltage at the contacts of the reversing switch then inspect the line for a broken lead or ground in same running to the polarity reversing switch.

Ammeter Does Not Indicate

If the ammeter does not indicate the proper output from the generator, strike the regulator a slight blow with the handle of a screw driver and if the ammeter does not yet indicate that the generator is charging, then examine the generator brushes and determine if they are properly seated on the commutator, that is, ascertain if the brushes are not worn too short to prevent the spring tension from keeping them in direct contact with the commutator. Next if the commutator throws sparks when the engine is speeded, up, clean the commutator with No. 00 sandpaper. If a regulator has cutin switch trouble this will be noticed by striking the regulator a light blow, and if it then commences to show charge on the dash ammeter, it will be necessary to install a new regulator.

To determine if the generator is operating properly remove the regulator and install three cotter pins in the holes in which the regulator contacts fit. Next place a voltmeter across the two outside cotter pins and short-circuit the two inside cotter pins, meaning the two cotter pins nearest the engine, at an engine speed of from 500 to 900 r.p.m., and if the voltmeter does not show any indication, this proves that the generator has an open circuit and either will have to be repaired or replaced. While making this test do not hold the short-circuit on the inside cotter pins too long, as this will burn out the voltmeter and generator, but break circuit just as the voltmeter indication commences to exceed 6 volts. If the voltmeter does not indicate over 4 volts at an engine speed of more than 1000 r.p.m., then this indicates that the generator has a short circuit, that is, with the voltmeter across the two outside cotter pins and the two inside cotter pins short circuited as stated above.

After making this test and the generator is found to be in working condition, this indicates that the regulator is out of order and that another regulator will have to be substituted in its place. This new regulator should show a voltage of 7.75 across the generator brushes regardless of the engine speed or the dash ammeter indication.

Providing the new regulator does not show a voltage of 7.75 and the commutator is arcing badly, sandpaper the commutator with No. 00 sandpaper until this condition is removed. If this arcing condition cannot be removed by sandpaper ring, this indicates a slight short or open circuit and if the arcing is extremely bad, this is a good indication of an open circuit. Now run the engine for a short time and then examine the commutator. If one bar in the commutator is found to be bluish in color, then turn the armature one-half turn and if two bars are found to be bluish in color, this signifies that the armature has an open circuit. When this condition is found generally part of the solder in the armature has been thrown out. This, of course, requires that the generator either be repaired or a new one installed. If this arcing condition is bad, after sandpapering examine commutator and determine if there are any signs of high mica, and if this proves to be so, the mica on the commutator will have to be under-cut.

Now install a new regulator and if same does not show a voltage of 7.75, place both hands on the body of the generator and regulator and note if a bad knock can be felt in either. If a bad knock is noticed in the generator, then the cause of this knock must be removed, which may be due to poor alignment of the generator, defective generator coupling or a broken generator bearing. Regulators are constructed to stand car vibration, and if any other continuous knocking is present in the generator it will cause the regulator points to break from a source other than the electrical and mechanical operation of the regulator.

If after any of the above tests the regulator is found to work perfectly, reverse the polarity reversing switch and see that generator charges on both sides of the polarity switch. If this is done while the engine is running the ammeter indicator will swing over to the discharge side and then back to the charge side.

After completing the above and it is known that the battery is in good condition, if it is found that the ammeter does not register properly or indicate on the discharge side, this can be due to two causes, either a ground in the field circuit or the generator lead is not attached to the right post of the starting switch. If the ammeter goes past the scale and shows an exceedingly high rate of charge and the regulator is known to be in good condition, this is a general indication that the ammeter shunt is partly gone or open-circuited.

METRIC MARKINGS ON TIRES

Motorists using Goodyear tires have noticed some strange numbers branded on the side walls of their tires and have asked many inquiries concerning the significance of the mysterious numerals. The explanation lies in the fact that the company is now showing the metric measurements as well as the size in inches.

The Goodyear company has taken a step in showing both inch and milimeter sizes on the tire. With so many tires going abroad it is necessary to show the sizes in metric measurements, as our American markings mean nothing to the continental Europeans. With the United States supplying not only its own army, but all the Allied armies, with tires, it is obvious that some universal system of measurement must be adopted to meet the unusual conditions arising from this interchange. The metric system of measurement appears to be the solution to this problem.

Marketing tires in the export trade has always been done at more or less of a disadvantage, on account of the difference in measuring systems. So that the value of an international system instead of unrelated units is appealing now as never before. The metric system has been legal in the United States since 1866, but it has not been extensively used.

In the utilization of the metric system in designating tire sizes the Goodyear company has inaugurated a radical change in the method of determining the size. American tire sizes are expressed by the outside diameter and the cross section diameter. Metric sizes are determined by the size of the rim on which the tire is to be used and the cross section diameter. For instance, a 30 by 3½ tire in metric terms becomes a 90/585, meaning a cross section diameter of 90 mm. to fit a rim of 585 mm. An inch equals about 25 mm.

Passenger car and truck tires are two American products that must help to win the war, and their use many thousands of miles away from the point of manufacture by nations using the metric system of measurement necessitates the adoption of the system of measurement most familiar to them.—Goodyear Tire & Rubber Co.

The Readers' Clearing House

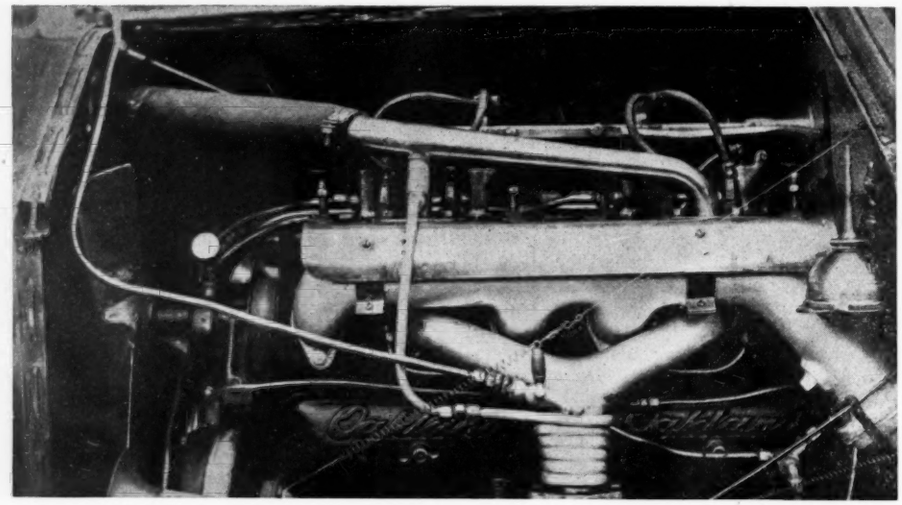


Fig. 1—Auxiliary air device designed by owner and installed on an Oakland

Address of Kingston Co.

Q.—What is the address of the company which makes the Kingston carbureter?—A Subscriber.

The Kingston carbureter is made by the Byrne Kingston Co., Kokomo, Ind.

Remodeling Curtains

Q.—How can the side curtains on a Marmon 34 roadster and seven-passenger car be arranged so that they will open with the doors. Marmons are equipped with Jiffy curtains which fit on the inside of the top.—H. F. Horhur, Kaukana, Wis.

It is practically impossible to fit door curtain carrier irons to curtains of this type on account of the method used in attaching the curtains to the top. However, if the curtains are mounted on separate rails this can then be done, but is almost as large a task as making an entire new set of curtains. Curtains that do open with the doors are usually individual and attached to the top by means of fasteners thus making it possible to use the door curtain carrier iron. In curtains of this type, sleeves are sewed in the door curtains so that the iron can be slipped into the sleeve to support the curtain when the door is open. It probably would be almost as expensive to remodel the old curtains as it would be to make a new set of curtains and the latter would be far the most satisfactory as remodeled curtains do not always present as neat an appearance as one would like to have in a car of this type.

Kerosene in Radiator

Q.—I know of a number of car owners that use kerosene for cooling purposes during the winter on cars that are equipped with a circulating pump and some even with the thermo-syphon cooling system. Is there anything about kerosene that injures a circulating pump any more than the hose connections?—Ford Driver.

About the only thing that can be said against the use of kerosene for anti-freeze solutions is that it attacks the hose connections and has a very unpleasant odor. There seems to be no good reason why the use of kerosene should have any detrimental effects upon a circulating pump, provided proper care is taken to clean out the entire system thoroughly in the spring. The substance generally used for this is soda ash, or you can make a concentrated solution of hot soda, using ordinary washing soda.

Removing Clutch on Maxwell

Q.—How can I disassemble the clutch on a Maxwell 50-6 to put in new leather facing. The car is a 1913 model.—J. Bush, Alta, Ohio.

To do this job properly requires special tools, as it is necessary to have some kind of a clamp to extend through the clutch cone. The bolts in the outer rim are then screwed in so that the clutch spring is depressed into the hub far enough to allow the horse-shoe washer to be removed. Then by removing the clamp, you will be able to slip out the cone.

Replacing Clutch Nut on Buick

Q.—I have a Buick model D-45, on which the clutch release bearing nut is badly worn. What is the easiest way to replace it?—W. M. Muret, Winfield, Kan.

1—In order to install a new clutch throw-out bearing nut, first disconnect the universal joint in the rear of the gearset by removing the row of bolts around the circumference of the driving flanges and then drop the propeller shaft so that it will not interfere with the removal of the gearset assembly. Before the gearset can be removed the lever on the right side of the gearset case, which adjusts the throw of the clutch pedal must be removed so that it will permit the gearset assembly to be moved back without difficulty. After having removed this lever take out the row of cap screws holding the gearset assembly to the flywheel housing and the gearset can be moved back, so that it can be dropped to the floor. The entire clutch assembly is now exposed so that one can work on it or it can be removed by taking out the four nuts holding the clutch in place by means of the clutch springs. The throw-out bearing can now be removed and a new one substituted in its place.

The Experiences of Others

Air Devices and Manifold

Windsor, Ont.—Editor MOTOR AGE—In reference to your inquiry in MOTOR AGE of Dec. 20 as to different experiences with air devices, I wish to state that I am running a Ford car and have had several experiences with air devices of different kinds. There is no question in my mind but what they save gasoline. I have demonstrated that conclusively, but there are several features on some of them that make them very objectionable.

For instance, several devices I used had automatic adjustments that were dependent upon a ball and spring check. The heat of the engine seems to take the temper out of the spring, making it practically useless. Secondly—in starting the car, the vacuum created by the engine turning over takes in so much air at the auxiliary intake that it chokes the engine. A further objection, as you well know, a Ford car cannot successfully be throttled down to better than 8 or 9 miles unless you run in low. In this event, so much air enters the engine that your engine necessarily races. Personally, I do not know what the objections are to racing an engine, but I have been told never to race mine.

I have lately bought a new device called the Wilgo, which seems to overcome all the objections I have found in the others. This is one that has a regulation from the dash board. The air is taken in at the dash board and it has an adjustment feature of four different adjustments, each one independent of the other and adjusted while the car is in motion right at the dash board. It can also be entirely shut off.

Have found with different tests that the increased mileage has been from 20 to 25 per cent. This is attached at the intake with a brass connection that is used for copper tubing and a piece of copper tubing running from this connection to the dash board.

Another feature that I have found with this particular device is that the air is taken in about 2½ ft. away from the intake and inasmuch as this connection runs alongside the engine, the air is heated by the time it strikes the intake pipe. A secondary feature is that it helps keep the car clean of carbon with the assistance of a little kerosene oil poured through the device at the dash board every week or so.

In answer to your question as to whether I would install one on a new car, I would say yes, by all means.—F. H. Wirtz.

Auxiliary Air Valve

Keokuk, Iowa—Editor MOTOR AGE—I see you want to know what experience different users of air valves in the intake manifold have. I have a valve that only costs $1 on my 1913 model Ford, and would not be without it, as it gives the engine more power and makes the engine run more smoothly. I installed this valve after I had made a trip from Keokuk to Des Moines, Iowa, via Iowa City, Iowa, and in going up, I obtained 19 miles to the gallon, and coming back with the air valve on, I obtained over 22 miles per gallon and I had to cut the supply down over one-half to three-fourths of a turn. After the engine gets warmed up with the valve closed and running at 20 m.p.h., by opening the air valve the car will pick up to 25 m.p.h., and sometimes more. I would say to any one thinking of installing an air valve that I think it will help save gasoline, and that is the great question nowadays, and will use as much air as possible. If I should change cars now, I would put on an air valve as one of the first things. This air valve and a Bosch high-tension magneto and a pair of shock absorbers is all I have put on my Ford and it will go with any Ford.—J. Earl Vanatta.

Heated Manifold

Elgin, Ill.—Editor MOTOR AGE—I notice in MOTOR AGE your editorial on fuel economy and heating gas. I have installed 130 Wilmo manifolds in all on Ford cars. The Wilmo manifold increases the power of Fords. I know of one man who put on a Wilmo manifold, who before was only getting 13 miles to a gallon. After putting on a Wilmo, he got 28 to the gallon, on one of the hottest days last summer. Other people I know have put on a Wilmo when their engines pump oil, but now they have the Wilmo their engines have not missed for six months.—J. H. Kramer.

Auxiliary Air Device

Indianapolis, Ind.—Editor MOTOR AGE—I have had experience with only one auxiliary air device, but I understand there are several on the market. A great many motorists have examined the one I have and each in turn has stated that the one I have, or rather the make, is the only one they have ever seen that is controlled by a positive adjustment which meets the different situations with which a driver has to contend.

The device on my car is known as the Wilgo gas saver. My car is a six-cylinder Studebaker. Many of my friends have told me that I drove my car with too lean a mixture as when starting there was the usual backfire. However, on account of having to practice economy, I found it advantageous to keep the mixture as lean as I could without sacrificing power. The statements referred to were made before I had the Wilgo installed. Prior to this, my mileage was around 10-12 m.p.h.

The explanation covering the Wilgo appealed to me and I had one put on. The result was almost spectacular. On No. 1 adjustment the engine would pick up quite noticeably, with spark and throttle retarded as low as could be set. On No. 2, the action increased, and on 3 and 4 the result would satisfy the most skeptical.

My mileage increased to an average of 14 miles. Not being conversant with engineering terms or technicalities, I cannot very well explain, how and why the result was manifested. This I do know, that there is a quantity of air going into the mixture after the mixture leaves the carbureter. When the instrument indicator is set 0 or neutral, the engine is running by virtue of the mixture from the carbureter. When the indicator is moved to the different adjustments, there is an acceleration without my opening the throttle.

On country roads I usually set the device on No. 4. For city driving, away from congested districts, I set it at 2 or 3 and in the congested area, 1. The instrument is placed in a handy position and never yet have I had difficulty in adjusting it, even in running into a congested district, as it is so simple.

I find that it is proper to run it on No. 1 in town, as one does not require the speed and, as the Wilgo accelerates the motive power, it naturally follows every time the crankshaft turns over, unnecessarily, there is a certain amount of fuel used.

The instrument is placed on the instrument board of the car and is connected by a copper tube, about ¼ in. in diameter, to the manifold.

Another commendable feature of the Wilgo is that one can clean the carbon from his car, without removing the spark plugs, etc. All that is necessary is to warm the engine up by running a few minutes, then turn the indicator around past No. 4 adjustment to the air intake opening, which will then be up, pour in a pint of kerosene slowly through the instrument, and when all is in, shut down engine and leave for 15 min. Then follow up with a pint of water and use the same process as with kerosene. The carbon being dissolved by oil is then driven out through the exhaust by the steam from the water. If anything happened to my outfit, and it was necessary to purchase another, I would not hesitate to pay $25 for it. It will pay for itself in a very short time.—R. J. Haley.

Injecting Water Vapor

Denver, Col.—Editor MOTOR AGE—I note you solicit experiences with air devices on engines. Here are my results. My car is a 6-30 Chalmers 35-C model five-passenger, weight, 3000 lb.

I first cut a 2-in. square hole in the steam drum of my radiator opposite the overflow pipe for access. I then took a piece of annealed copper tubing, ⅛ in., and made a coil that would fit inside the steam drum, letting one end come out the filler pipe the same height as the overflow, and the other end came down to the dust pan. Before securing this end, I drilled ⅛-in. hole in a plate slightly larger than the one I cut and with the pipe in this I soldered it on, making the drum again water tight. I then improvised a flapper valve for the original overflow pipe, with a water reservoir, which pressure would open. To the other opening in the valve I connected flexible tubing, ran it along the exhaust pipe and to a pet cock on the dash. From the other end of the pet cock, I ran a piece of copper tubing to the spacer between the block and carbureter and joined it to a nipple opposite the vacuum suction. By the following you will note I take suction from the atmosphere, which is heated passing through the coil and mixes with the vapor in the steam drum. Both are carried by suction into the engine. The coil being ⅛-in. and the overflow ¼-in., you have a slight vacuum, the filler cap being tight.

For mileage test, I inserted a valve in the suction between spacer and vacuum tank which allowed me to use the tank for experimental purposes. The engine being warm, I drained the vacuum tank and carbureter and filled again with 1 qt. of gasoline. I ran the car between 18 and 20 m.p.h. until it stopped. I covered 5.2 miles. I repeated the same operation with the air device operating, covering the same course, and I got 5.4 miles. The atmospheric temperature was 22 above zero, road good. In addition to the 0.2 mile gained in a gallon of gasoline, smoothness is very apparent and an inspection of my spark plugs is proof that my explosion chamber must be in good condition. At the minor cost involved, I am more than pleased with the experiment, and if you think the article worth while, you can submit it to your readers.—John P. Hancock.

Water Vapor and Air

Los Gatos, Cal.—Editor MOTOR AGE—In answer to your recent query as to the experiences of motor car owners with auxiliary air devices, I submit the following:

As your question deals with devices already on the market, I shall take the liberty of describing one designed by myself; it is shown in Fig. 1. The car is an Oakland, Model 42, 1913, with a four-cylinder Northway engine.

In 1914 I attached a pet cock to the intake manifold as far above the carbureter as possible and connected same with ⅛-in. brass tubing to the valve lift chamber by drilling a small hole in the cover plate. My idea was to get warm air, as well as a little oil mixed with it. This arrangement gave me some 2 or 3 miles more in speed, but made no difference in fuel consumption.

A little later, I decided to take the auxiliary air from the radiator, the photo shows the tubing attached just below the filler cap, also the arrangement for controlling the pet cock, but wire from the steering post. I have found the above device to give me from 1 to 3 miles more per gallon of gasoline, also from 4 to 5 miles more per hour. Such a device, of course, can only be used at a speed of about 15 m.p.h. or over.

I also find that the moist air helps to keep down the forma-

tion of carbon, but does not prevent it entirely. However, in my opinion there are very few, if any devices, that will accomplish that end.

You ask the question as to whether or not I would fit a similar device to another car. If said car was a 1916 or 1917 model, I would not, for I believe that the carbureter and manifolds on the later models are very well adapted to handle the present low grade of gasoline, without any of these devices. The only exception I might make would be in the use of those devices that allow a small amount of water to be mixed with the fuel.

In my opinion many of the devices on the market for saving of fuel and keeping down carbon are more or less complicated, and the average car owner sooner or later neglects to give all his spare time and attention to the many other necessary details on the modern engine.

I might say that in addition to the auxiliary air device, described above, I also fitted a hot water coil around the manifold, just above the carbureter, which I am sure does its part toward saving fuel, particularly in cold weather. It is merely a sort of by-pass connected to each water manifold.—E. E. Pomeroy.

Engines

Horsepower of Oldsmobile

Q.—What is the actual brake horsepower of the Oldsmobile eight-cylinder model 45?—W. M. Muret, Winfield, Kan.

The manufacturer states that the engine in this model develops 58 hp.

Finding Engine Revolutions

Waterloo, Iowa—Editor MOTOR AGE—In a November issue I notice question of revolutions per minute of a Ford engine going 20 m.p.h. I wish to submit a simple way of doing this which I worked out some years ago while experimenting with building motor cars. To find this for any size rear wheel at any car speed, use the constant 336—divide this by the diameter of the rear wheel in inches, which gives the result in the Ford case of 11.2 r.p.m. of the rear wheel at 1 m.p.h. Multiplying this by speed of the car, 20 m.p.h. would make 224 r.p.m. of the rear wheel. Multiply this by the gear ratio 3.63, which equals 813.12 r.p.m. for the engine. Multiply the revolutions of the rear wheel per minute when the car is going 1 m.p.h. which is 11.2, by 60, and this gives the number of turns the rear wheel makes in 1 mile or 672.—Member of S. A. E.

Engine Stops Suddenly

Q.—I have a 1912 Cadillac car, which I drove about 18 miles. The car came to a complete stop. It had plenty of fuel but could not get the car to start. I got a mechanic to look over the car, who filed the platinum point buzzer on front dash under hood. The car then ran O. K. On the next day I ran it the same distance and it stopped again. The engine is in A-1 condition. Have just had storage battery recharged, but engine when self-starter is put on to start will grind and turn over slowly. I also have six dry batteries, but cannot start the engine with these. I don't think I have the proper spark. What is the cause of this trouble?—M. G. Doniphan, Charleston, S. C.

Trouble like you are having is often very elusive, although as long as you state that the battery, etc., is in good condition, we would suspect a loose wire, sticking interrupter points or a ground somewhere in the line. The only way to go about trouble of this kind is to trace all the wiring for broken or loose connections, especially those pertaining to the ignition. Look at the wires leading from the battery first, if one of these is loose or broken so that it makes only a partial connection, your starting motor will be sluggish in action. The fact that the power fails suddenly would indicate that the trouble was in the electrical system somewhere. We believe that by a thorough inspection of the points on the circuit breaker, wiring and connections will reveal the location of the trouble.

Balancing V-type Engine

Q.—Give some information on balancing a 45-deg. long-stroke, twelve-cylinder engine. What part of the connecting rod must be used to get a good balance on all speeds? The counterweights that are on the flywheels are out about 1 in. farther from the center of rotation than the crankpin is. I think they should both be the same distance. Is this right?—J. E. Murphy, Spokane, Wash.

The balancing of an engine is more or less of an approximation of the best. However counterweighting a crankshaft to cancel the centrifugal forces generated by the weight of the crankpin and the weight of connecting rod lower end that is considered as being in rotating motion, has proved satisfactory within the present limits of crankshaft speed of commercial engines. In your case the counterweights have been placed farther from the center of rotation so that the forces set up by the weight of the crank pin and the connecting rod lower end will be counteracted by the forces due to the weight of the counter weights. If the engine were being balanced for the weight of the crank pin alone then the counter weight would be equi-distant from the center of rotation but as the force set up by the weight of the connecting rod lower end must be considered to secure practical balance, therefore we must either increase the size of the counter weights or else increase the radius of rotation of the counter weights. In V-type engines the latter method is usually resorted to on account of space limitations.

Experience Meeting

What Was Your Experience with Water Vapor Injection?

MANY readers would like to know whether the injection of water or steam into the cylinders has proved worth while in practice. Many enthusiasts have tried out some of these, whether of their own construction or those marketed for the purpose of giving better combustion, keeping down carbon formation, etc. You who have tried these can help many other readers by telling us how they worked out. In writing, tell the name of the device, concisely, its scheme of operation, how long you used it, what mileage per gallon you were getting before using it, what mileage you got with it, what changes were made in the carbureter adjustment, etc. Also the general effect in the running of the car, as to pulling, starting, acceleration, etc. Also its effect as a carbon remover. Are you using it now and if not, why not?

This will be used with your signature or not as you prefer, but in every case the letter must carry full name and address.

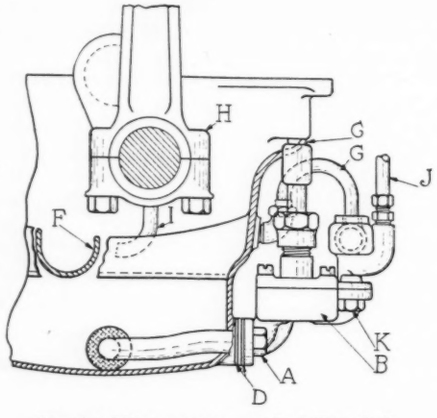


Fig. 2—Oiling arrangement of Herschell-Spillman used on Premier in 1914

N. A. C. C. Rating of Cars

Q.—Give me the A. L. A. M. rating of the following cars: Overland model 75-B, Overland model 85-4, Willys-Knight model 88-4, Overland model 90, Haynes Light Six model 35, and the Buick D-54 Six.—M. A. Ayars, Moweaqua, Ill.

The A. L. A. M. or more properly the N. A. C. C. rating of these cars is as follows:

Make	Bore and Stroke	N. A. C. C. hp.
Overland 75-B	3⅛ by 5	15.63
Overland 85-4	4⅛ by 4½	27.23
Overland 90	3⅜ by 5	20.37
Willys-Knight 88-4	4⅛ by 4½	27.23
Haynes Six Model 35	3½ by 5	29.4
Buick Six D-54	3¼ by 4½	25.35

This rating is determined by the formula $\frac{D^2xN}{2.5}$ which is based on a piston speed of 1000 ft. per minute, where D is the diameter of the cylinder bore in inches and N in the number of cylinders.

Lubrication

Herschell-Spillman Oiling

Q.—Give layout of oiling system of Herschell-Spillman 4 by 5 six-cylinder engine of 1914.—E. Solman, Toronto, Canada.

We have no diagram of the oiling system as used on this particular engine, but in Fig. 2 is shown the oiling arrangement of the Herschell-Spillman engine used in the Premier car of 1914. We understand that this system of lubrication was carried out about in the same way on the six-cylinder engine of 4-in. bore and 5-in. stroke.

The engine is lubricated by splash in the crankcase with a constant-level circulating system. Oil is supplied through the opening on the side of the engine and there should always be sufficient in the system when starting on a run to allow a little to drip out of the pet cock in the lower half of the crankcase. The oil is forced by a gear-driven pump B at the right rear lower corner of the crankcase, to troughs F cast integral with the crankcase bottom. Pipes G lead from the pump to each trough and when these overflow the

oil drips to the bottom and returns through a filter to the pump where it is again forced through the system. On the bottom of the connecting rods H are little cups I, which splash oil sufficiently to supply the cylinders and bearings. The troughs are so shaped that the amount of oil is always the same regardless of road conditions. A lead J from the pump goes to the oil indicator on the dash, by which the operator may know that circulation is going on.

If the filter needs cleaning the screws K are removed, which, with screws A hold the oil pump to the crankcase. Now draw the pump downward, disengaging it from the distributor shaft C. Then remove the oil pump pipe from the crankcase and clean it. Preserve the gasket D and when replacing the pump do not tighten screws A unnecessarily tight.

Lubrication for Buick

Q.—What is the diameter and lift of the valves of the Buick small six-cylinder car?

2—Will high speed driving hurt the Buick small six-cylinder car?

3—Give diagram for an auxiliary oiling system such as a dash pump, if this would be necessary for fast driving in a Buick small six-cylinder car?

4—How far should these Buick small six-cylinder cars be driven to break it in when new.—George Huyck, Topeka, Kan.

The exhaust valve is 1⅝ in. in diameter and the inlet 1¼. The lift of both valves is $\frac{9}{32}$ in.

2—This is rather a difficult question to answer as high speed driving is bound to prove more or less injurious to any make of car. Driving speed is limited by the condition of the highway and good judgment should be exercised when passing over rough roads in order to prevent undue damage.

3—We are of the opinion that the standard oiling system would be capable of supplying sufficient lubricant to the engine.

4—Almost any car can be well limbered up by 500 miles of driving at a speed not to exceed 20 m.p.h.

Carburetion

Carbureter for Two-Cycle Engine

Q.—Give me some information in regard to using a Kingston carbureter on a two-cycle engine.—J. E. Murphy, Spokane, Wash.

The Kingston carbureter has been used successfully on a number of two stroke cycle engines and there is no reason why it cannot be installed to give good satisfaction in your case. Not knowing the make of engine to which you refer it is not possible for us to offer any definite suggestions.

Carburetion on Haynes

Q.—I have an old four-cylinder Haynes that I wish to change. The engine has a long Y-shaped intake manifold that places the carbureter down about 12 in. from the inlet to cylinders. I want to make a new manifold out of pipe fittings, straight across, placing a tee in the middle and connect the carbureter close up, which will raise it 10 to 12 in. from the old position. I will make a tight sheet iron jacket for the new manifold and run a ¾-in. pipe connection from the exhaust manifold to it to convey heat, with an outlet pipe from the heater low enough to carry the gas away. I now have a Rayfield carbureter, 1½ in. size, and am thinking of exchanging it for a GL 1¼ in. size and connecting this up with a branch pipe ¼ in. from the exhaust pipe to the waterjacket, to heat the carbureter. I will place valves in the pipes to regulate the flow of exhaust heat to each part. I should like to know if the 1¼ in. size carbureter placed up close and heated will be large enough for the engine or would 1½ in. be better without the heat?

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as ignition, carburetion, etc., MOTOR AGE has inaugurated the segregation of inquiries into classes of allied nature. Questions pertaining to cooling will be answered under that head and so on.

MICELLANEOUS

Subscriber ..... Chicago
H. F. Horhur.....Kaukana, Wis.
Ford Driver.....Chicago
J. Bush.....Alta, Ohio
W. M. Muret.....Winfield, Kan.

EXPERIENCES

F. H. Wirtz.....Windsor, Ont.
J. H. Kramer.....Elgin, Ill.
J. Earl Vanatta.....Keokuk, Iowa
R. J. Haley.....Indianapolis, Ind.
John P. Hancock.....Denver, Col.
E. E. Poberoy.....Los Gatos, Cal.

ENGINES

S. A. E. Member.....Waterloo, Iowa
M. G. Doniphan.....Charleston, S. C.
J. E. Murphy.....Spokane, Wash.
M. A. Ayars.....Moweaqua, Ill.

LUBRICATION

E. Solman.....Toronto, Can.
George Huyck.....Topeka, Kan.

CARBURETION

J. E. Murphy.....Spokane, Wash.
C. C. Boies.....Bloomington, Ill.

THE ELECTRIC SYSTEM

Ray Sander.....Austin, Minn.
Carl Teachout.....Superior, Neb.
O. J. Wheeler.....St. Louis, Mo.
John Goldsmith.....Harlan, Ind.

REBUILDING

M. K. Witt.....Comanche, Tex.
T. Roberts.....Ottawa, Can.
H. D. Brainard Fairburn, S. D.
Roy H. Austin.....Sabula, Iowa

No communication not signed by the writer's name and address will be answered in this department.

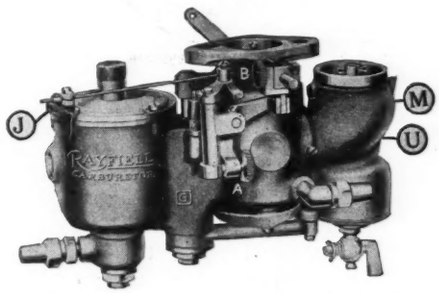


Fig. 3—Reference to this explains adjustments of Rayfield carbureter

2—Will the ⅜ in. pipe be large enough to carry sufficient heat for jacket around the inlet manifold and the carbureter?

3—Explain the adjustment of the Rayfield model G carbureter in your magazine, or give me the number of copy if you have given it in some previous issue.

4—If I make the above changes I will put in a Stewart vacuum-feed tank to get the gasoline to the carbureter in the raised position. Will this have a tendency to make the engine start easier and will it lead to any economy in gasoline?—C. C. Boies, Bloomington, Ill.

1—As long as the engine was originally fitted with a 1½-in. carbureter we believe you will be better off by adhering to this size, otherwise the engine will be starved. Get all the heat you can to the carbureter. Also in making the manifold, see that the interior of the pipe is smooth and for best results the inside diameter of the cross main should be about 1¾ in. This means an outside diameter of about 2 in.

2—Either a ⅜ or ½ in. pipe should be large enough for this if it is properly installed. However, experimenting with a few different sizes is the best way to tell.

3—When adjusting a Rayfield carbureter it is important to remember that both high and low speed adjustments are turned to the right for a richer mixture as indicated on adjustment screw heads. Before making any adjustments be sure that there are no air leaks in the manifold; that valves and ignition are properly timed and that there is a hot spark and good compression in all cylinders. Always adjust the carbureter with the dash control down. The low speed adjustment must be made before the high speed.

To adjust the low speed, close the throttle and with the dash adjustment down, close the nozzle needle by turning the low speed adjusting screw A to the left until block U slightly leaves contact with the cam M. Then turn to the right about three complete turns. Open throttle not more than one-quarter. Prime the carbureter by pulling steadily on the priming lever G for a few seconds. Start the engine and let it run for a few minutes, to warm it up. Then with retarded spark, close the throttle and let the engine run slowly without stopping. Now, with the engine thoroughly warm, make the final low speed adjustment by turning the low speed screw N to the left until the engine slows down and then turn to the right a notch at a time until the engine idles smoothly. If the engine does not throttle low enough, turn stop arm screw to the left until it runs at the lowest number of revolutions desired.

To make the high speed adjustment advance the spark about a quarter turn and open the throttle rather quickly. Should the engine backfire it shows that the mixture is too lean. Correct this by turning the high speed adjusting screw B, Fig. 3, to the right about one notch at a time, until the throttle can be opened quickly without making the engine backfire. If loading is experienced when running under a heavy load with the throttle wide open, it indicates too rich a mixture. This can be overcome by turning the high speed adjustment to the left. Adjustments made for high speeds will in no way effect low speed. Remember that the low speed adjustment is to be used only when the engine is running idle and positively must not be used in adjusting the high speed.

4—You will perhaps notice a slight saving in fuel, but so far as easy starting is concerned, the installation of a vacuum tank has nothing to do with it. The vacuum tank merely draws the fuel from the main tank to the carbureter bowl.

The Electric System

How Third Brush System Works

Q.—Explain the third brush system—how it weakens the fields at high speeds. Why is there an odd number of segments in the commutator? Which is the better, an even or odd number? How can you tell by looking at a system if it is dangerous to run it with the battery removed, without grounding the battery wires? What kind of systems can you run with the battery removed without grounding the wires? Which is best, voltage or amperage regulation and what is the difference?—Ray Sander, Austin, Minn.

In a third-brush regulating system the field winding of the generator is connected between one of the main brushes and a third brush which is located about midway between the two main brushes. The main brushes are set in the line of maximum voltage when no current is being generated. That is, if the two brushes were shifted either forward or backward from the position they occupy, the voltage be-

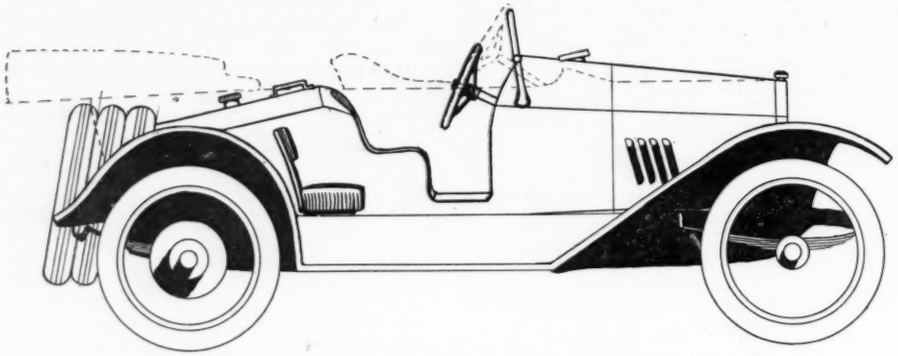


Fig. 4—Suggestion for changing 1913 Halladay touring car into roadster

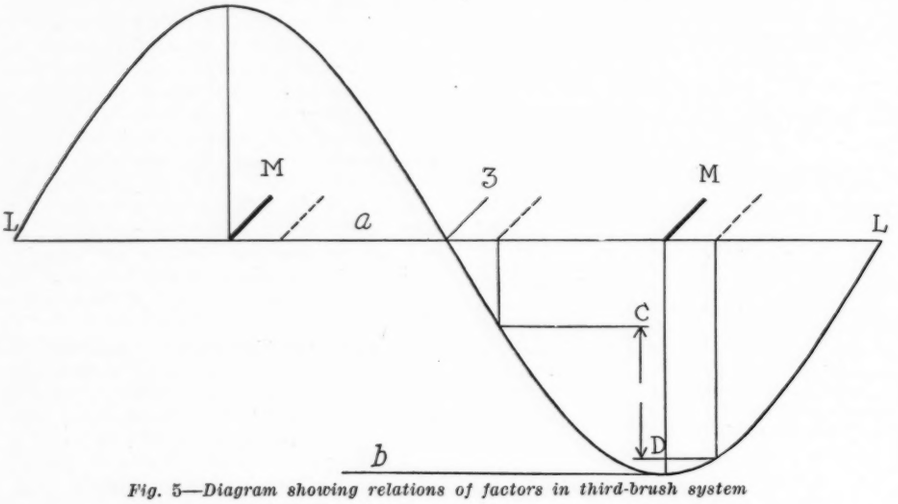


Fig. 5—Diagram showing relations of factors in third-brush system

tween them would decrease. When the generator delivers current, this line of maximum voltage is shifted forward, in the direction of rotation of the armature. This is due to the armature reaction or cross-magnetization. The effect is the same as if all three brushes were shifted backward. The relations are shown in the diagram herewith in which the straight line LL represents the circumference of the commutator and the two sine curves the distribution of voltage around it. When there is no armature reaction the field voltage between the main brush M and the third brush 3 is represented by a b. When the magnetic field is shifted by armature cross-magnetization, as indicated by the dotted position of the brushes, the voltage on the field is equal only to the amount represented by the line cd. As the engine speed increases the charging current increases, but the increasing armature current weakens the field and thus tends to regulate the output.

Either an odd or an even number of commutator segments and armature sections may be used. Certain forms of armature windings require an odd number, but there is no general advantage in either an even or an odd number.

Any system that has constant current control cannot be run without the battery or without having the battery cable grounded. Suppose, for instance, the battery circuit were open and only the dash and tail lamp were turned on. Then since at normal voltage the current would be far below that for which the regulator is set the voltage would increase with the engine speed until the lamps burned out. The only system that can be operated with the battery circuit open is that having constant voltage control. Since the voltage cannot exceed a certain value no damage can be done to the lamps.

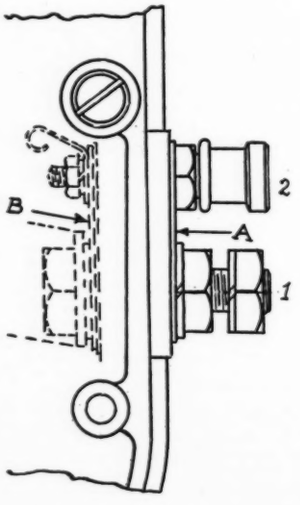


Fig. 6—Connections of ammeter on Hudson

A voltage regulator is a device operated by a solenoid or electro-magnet connected in shunt across the terminals of the generator and keeps the generator voltage constant. An amperage regulator is operated by a solenoid or electro-magnet connected in series with the main circuit of the generator and keeps the current output constant. Each system has advantages of its own. With voltage regulation, for instance, you do not keep on pumping electricity at the maximum rate into a battery that is already fully charged. With current control you are sure to get a good current through a badly sulphated battery, and which in consequence offers a high resistance.

Magneto Fires on Two Only

Q.—I bought a Bosch DU four magneto and tried to put it on a model 25 Buick, following your system as shown in MOTOR AGE of Nov. 8, but it does not work right. The cylinders one and two work all right, but cylinders three and four will not fire at all. What is the trouble? —Carl Teachout, Superior, Neb.

This is probably due to the fact that the wires leading to cylinders three and four are reversed. If this does not prove to be the trouble then it might be due to a cracked distributor board which causes a short between these two wires. It is sometimes very difficult to determine whether or not a board is cracked and the best method is to test by using another board for test purposes.

Ammeter on Hudson

Q.—Publish diagram and instructions for connecting an ammeter on a Hudson 6-40, 1914 model.—O. J. Wheeler, St. Louis, Mo.

To connect the ammeter on this model, the strap connecting the terminals 1 and 2, in Fig. 6, of the motor-generator must be removed. On some of the machines this strap is on the inside of the frame, as shown at B, making it necessary to remove the motor-generator from the car and disassemble it in order to cut out the strap, on some other cars the strap is on the outside, as shown at A. In this case it can be cut with a hack saw, without removing the motor-generator from the car. After this strap has been cut, a tap is made on the wire from No. 2 terminal to the positive terminal of the ammeter, and a wire run from the other terminal of the ammeter to No. 1 terminal.

Wants Storage Battery Information

Q.—I am desirous of learning the storage battery business and would like to know if there are any schools that teach this. Or if any of the storage battery concerns have a department where one could work and learn the business.—John Goldsmith, Harlan, Ind.

Some motor car schools include in their curriculum a course in storage battery maintenance. Many of the storage battery companies state that they maintain schools of battery instruction, but in most cases these are open only to those who anticipate opening a service station handling that particular make of battery. For example, the Willard Storage Battery Co., Cleveland, Ohio, maintains a school of battery instruction, but enrollments in this are available only for their employees, service station dealers, or their employees. If you wish to take advantage of this school, you should affiliate with one of the Willard service stations and get the necessary preliminary experience. Then you could make arrangements with your employer to have him enroll you in one of the classes at the Willard factory.

The U. S. Light & Heat Corp., Niagara Falls, N. Y., which makes the U. S. L. batteries also has a department for instructing men desirous of learning the battery business. This opportunity is extended only to men who contemplate opening U. S. L. service stations, or who expect to be employed by some service station handling this battery.

The Gould Storage Battery Co., New York, provides means for instructions at its factory or one of its service stations for those who expect to take the agency for Gould batteries. There is no charge for this instruction, the only expense being transportation and living.

Other battery makers offer about the same methods of instruction and the above three cases are cited merely as examples. We suggest that you get in touch with the maker of whatever make of battery you expect to handle.

Rebuilding

An Eight-Cylinder Ford!

Comanche, Tex.—Editor MOTOR AGE—I am sending herewith a photograph of a home-made eight-cylinder Ford which I constructed and which I thought would be of interest to MOTOR AGE readers. The engine was built by welding together two cylinder blocks, end to end, after which all of the machinery was carefully fitted in the blocks, welding two crankshafts together and likewise two camshafts, so that the firing of the second block comes midway between the firing of the first block. The engine has electric starter and foot accelerator.

The power of this engine easily doubles that of the ordinary Ford and I have been able to get about 16 miles to the gallon. A few days after the engine was placed in the car I drove the latter to Galveston and returned without a mishap. No attention whatever was given the engine outside of such items as occur with any engine.—M. K. Witt.

Rebuilding Underslung American

Q.—I am going to rebuild my American 30 Underslung as a racer. Show drawing giving your idea of a racer body for this car, without mudguards and with individual windshield, using the original cowl and hood.

2—Would you advise lightening the pistons and rods by boring holes?

3—The car is equipped with Baker rims and they have gotten a trifle loose. Is there any way of remedying this? Is the Baker Co. still in business? What is their address?—T. Roberts, Ottawa, Canada.

1—A suggested body design is shown in Fig. 9.

2—It undoubtedly would be advantageous to lighten the pistons either by installing light weight pistons of cast iron or aluminum or by reducing the weight of the old ones by drilling. To reduce the weight of the old pistons, a series of holes about ⅜ in. in diameter should be drilled in the skirt of the piston about 1½ in. apart around the circumference of the piston. If aluminum pistons are installed, it will be best to have the cylinder block reground so that the new pistons can be properly fitted in order to secure the best results. It is not advisable to attempt to reduce the weight of the connecting rods unless light weight pistons are installed and then this can be done by drilling a series of holes about $\frac{5}{16}$ in. diameter in the body of the rod, being careful not to drill within an inch of either end of the rod as these parts are subject to the greatest load.

3—The rims can be made to fit the wheel securely by the use of oversize lugs. The Baker rim is made by the Stone-Thompson Mfg. Co., 1502 Michigan avenue, Chicago.

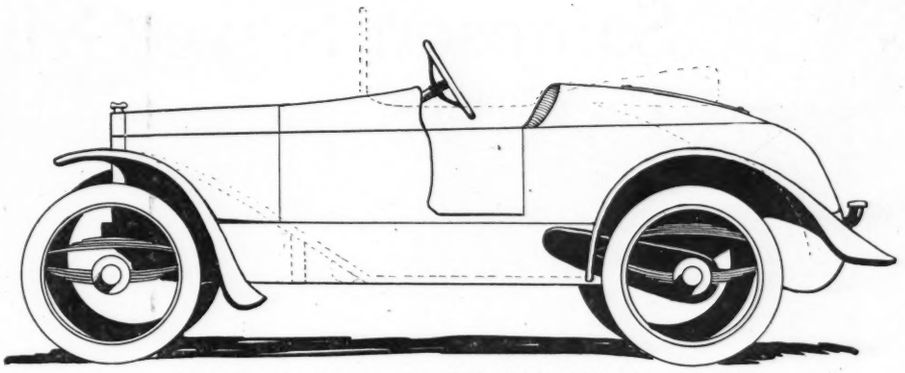


Fig. 8—Suggestion for transforming 1916 Metz roadster into speedster

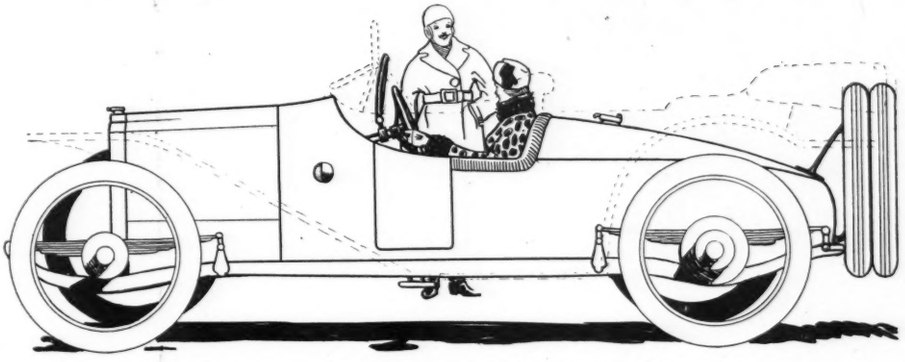


Fig. 9—Suggestion for changing underslung American model into racer

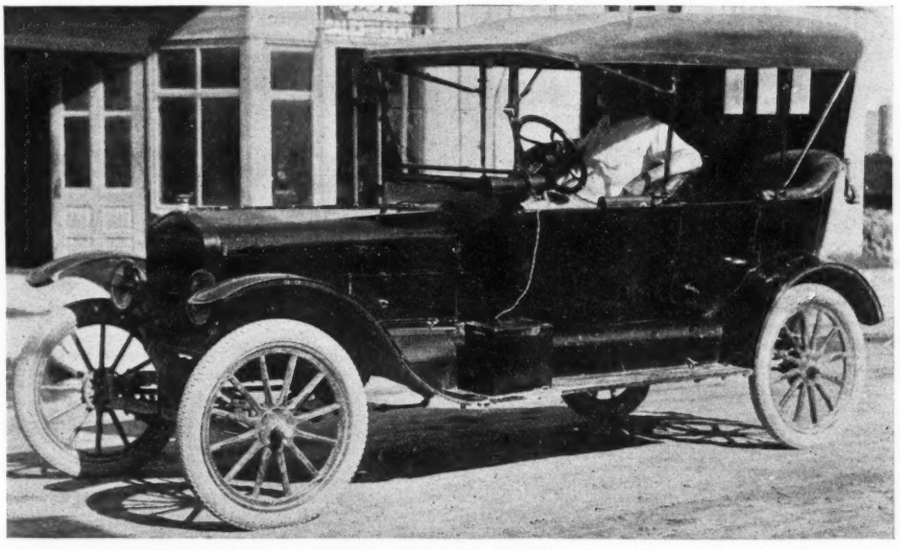


Fig. 7—Twelve-cylinder Ford car constructed by reader of Motor Age

Changing Metz to Speedster

Q.—Give suggestions and sketch for speedster body for a 1916 Metz roadster, which I wish to convert into a speedster.—H. D. Brainard, Fairburn, S. D.

A suggestion for converting this car into a speedster is shown in Fig. 8. Among the things we might suggest in the way of increasing the speed of this car is to rebore the cylinders slightly and fit lightweight pistons, either aluminum or gray iron. You can also increase the size of the valves, but if you do this it would be wise also to fit a larger carbureter, which would necessitate a different intake manifold. Advance the ignition; that is, set the spark so that it occurs sooner than it does now in relation to the piston travel. To do this you will have to remove the cover of the timing gear case and remesh the gears.

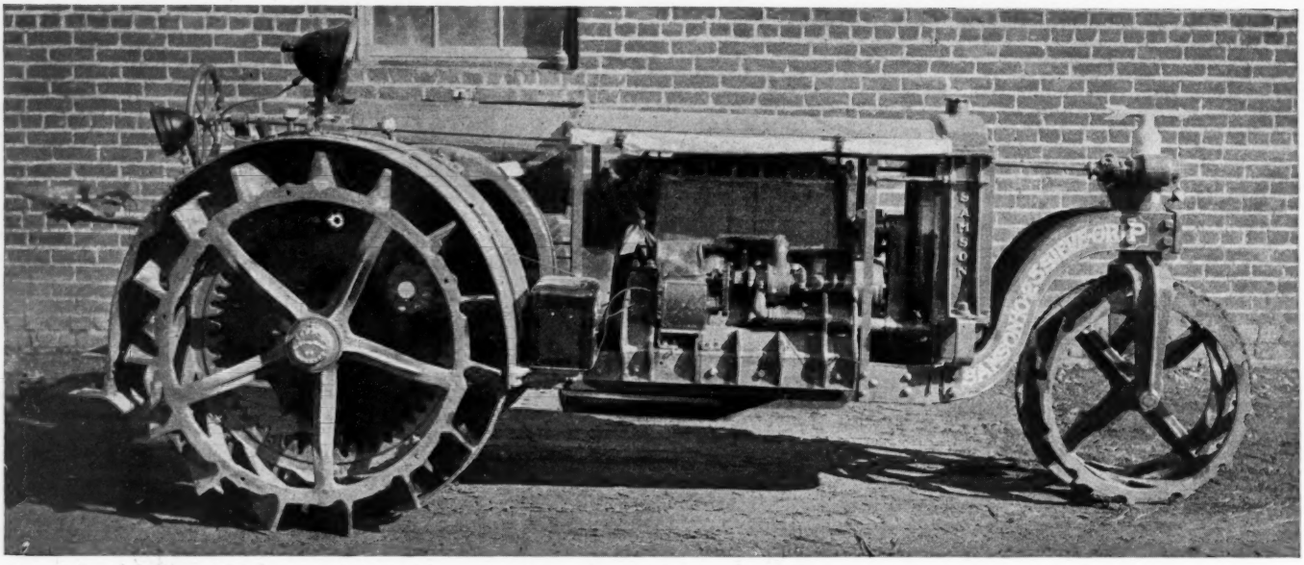
So far as the other parts of the chassis are concerned, we do not think there is much that you can do in the way of altering the construction. Some owners have gone to considerable expense and taken out the friction transmission and rear axle, substituting in their place a gear-driven rear axle, similar to the Ford. Of course, this requires some kind of a gearset and to get around this in some cases the Ford planetary transmission has been installed on the Metz flywheel.

1913 Halladay Into Roadster

Q.—Show diagram of 1913 Halladay touring car, model 32, made into a roadster. I wish to put on a roadster body.—Roy H. Austin, Sabula, Iowa.

This car transformed from a touring model into a roadster is shown in Fig. 4.

Sampson Sieve-Grip Tactor



Side view of Samson tractor, which is a three-wheel type listed to sell at $1,500

THE Samson Sieve-Grip Tractor, product, originally of the Samson Sieve-Grip Tractor Co., Stockton, Cal., is now being made by the General Motor Corp. This tractor was taken over by W. C. Durant last spring, and while not generally known east of the Rocky Mountains, has been developed for fifteen years in and around Stockton, Cal. The first Samson tractor was made in 1902, and during the years since that time has been made in many different styles, including two, three and four-cylinder engines of horizontal and vertical type and also with various types of drives, having three and four wheels and one, two, and three speeds.

Three-Wheel Type

The present job is the result of this development and is a three-wheel type of low-hung characteristics, adaptable to orchard and vineyard work, with a pulling capacity approximating that of ten horses. Under average conditions it will plow one acre an hour with three 14-in. plows, and it will pull a 10-ft. double disk harrow, or two 10-ft. single disk harrows.

The tractor is a three-wheel affair, having a single guide wheel in front with the two driving wheels in the rear. The final drive is by means of an internal gear on the rear wheel in which the drive is taken from the differential to the wheels through a jackshaft secured to the axle, the final drive being through spur pinions to an internal bull gear. The front wheel bearing is in a fork which is pivoted above the front wheel in very much the same way as the bicycle frame. The steering motion is imparted to this front wheel by means of a worm gear which is controlled by a horizontal rod running back to the steering wheel.

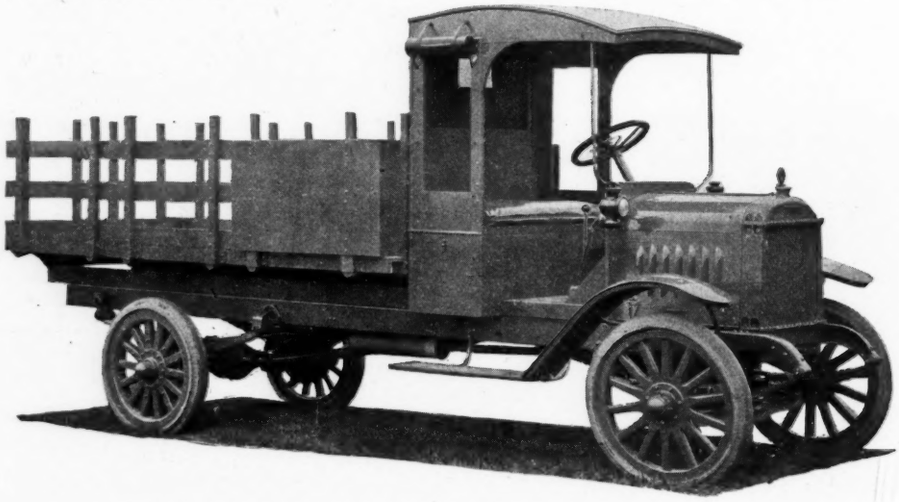
The frame work of the tractor is made by a built-up triangular construction with the steering and guide wheel located at the front tip of the triangle, which has a beak drop immediately behind the steering wheel. The side members run back and carry the internal gear, drive axle, and also the dead axle which supports the wheel. The radiator is mounted directly behind the drop in the frame and carries a hood similar to that used in motor car practice with the exception that the side sheets of the hood are composed of canvas which can be rolled up in dry, hot weather, permitting an easy circulation of air around the engine.

The engine is a four-cylinder, block type, having a bore of 4¼ in. and a stroke of 6¾ in. The valves are on the left, and the design is conventional throughout, the type of construction being a detachable head style. The engine is cooled by centrifugal pump with a front fan, and the radiator is a fin tube vertical type with a semi-steel case having the tubes set in sheet brass.

Single ignition is used, the source of current being the high-tension Eisemann, water-proof, Model G-4 magneto with fixed spark. No lighting or starting systems are supplied as stock, but for night work it is easy to mount spot lights on the frame work of the tractor. The governor is a loose revolving ball type driven from the engine and made by the G. M. C. Samson concern. It holds the speed of the engine to 900 r. p. m., which gives a tractor speed of 2.25 m. p. h. Fuel is fed by gravity through a Marvel Model E carbureter from a gravity tank located on top, over the center of the tractor.

Lubrication is by circulation splash with a gear pump delivering oil to a trough above each bearing, supplying oil for the connecting rod dippers.

The drive is taken by means of an expanding shoe type of clutch, faced with Raybestos through a constant mesh gearbox giving one forward and one reverse speed. The box is so arranged as to be direct in both gears, and the same reduction of 44 to 1 applies in both instances. The drive then passes through the jack-



New Defiance 1½-ton truck, which will sell at $1,595 without body

shaft and internal gear system, with the dead rear axle bolted to the frame. The dead axle is at the rear of the frame.

The parts for this tractor practically all are made at the G. M. C. plant. The engine is the Samson type, and the radiator is a McCord. Some of the important dimensions of the tractor are as follows: Over-all length, 13 ft. 4 in.; width, 5 ft. 4½ in.; height, 4 ft. 8 in. Draw bar pull varies between 1800 and 3000 ft.-lb.

The price of the tractor is $1,500 f. o. b. Pontiac, Mich.

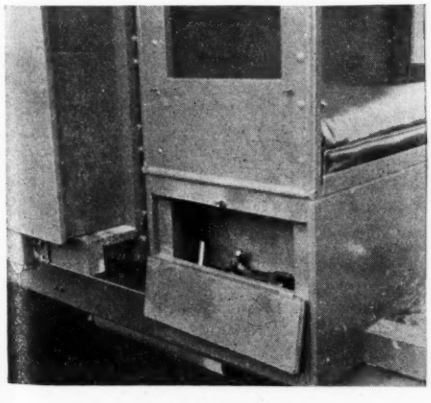
Defiance 1½-Ton Trucks with Allen Engine

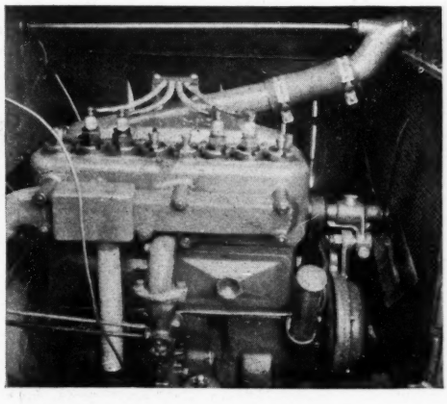
THE new Defiance 1½-ton trucks, made by the Turnbull Motor Truck & Wagon Co., Fostoria, Ohio, will be marketed largely through the same sales organization which markets the Allen passenger cars and will have the Allen 3¾ by 5 in., four-cylinder, block engine, with thermo-syphon cooling through a cast tank type of radiator.

Ignition is by the Eisemann high-tension magneto, and the carbureter is a Model M1 Stromberg. The governor is a Monarch automatic. The fuel is fed by gravity from a 20-gal. tank under the driver's seat, the tank being supported at three points, rendering it free from distortion due to frame weaving. Drive is taken through a Borg & Beck three-plate disk clutch to a Grant-Lees three-speed gearbox mounted on S. K. F. ball bearings on both main and countershafts. The gear reductions are 24 to 1 on the first speed, 13.8 to 1 in intermediate and 8 to 1 on high, the final drive being the Torbensen internal gear axle with 8 to 1 ratio. The drive-shaft unit is made up of two Arvac inclosed universal joints and a 2½-in. diameter tubular propeller shaft. The front axle is also a Torbensen I-beam, with roller bearings in the hub.

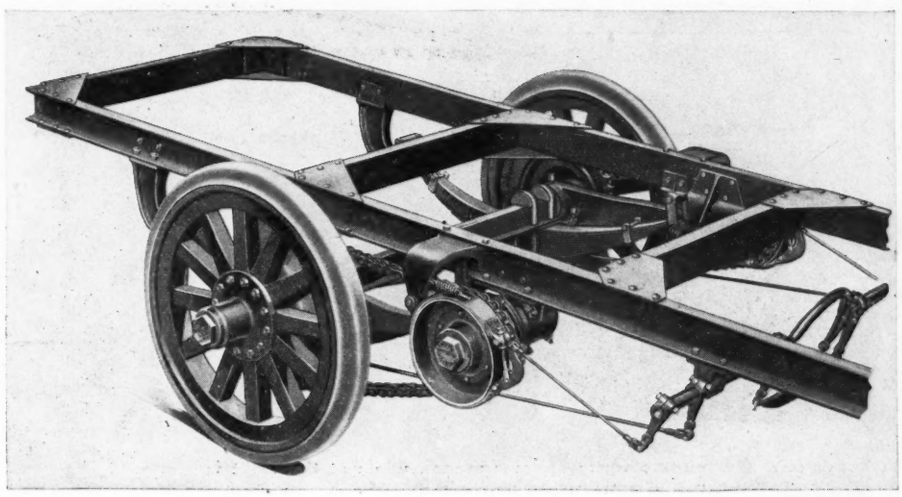
The frame is pressed steel channel, 5⅝ in. deep, carried on semi-elliptic springs 54 by 2½ in. in the rear and 42 by 2¼ in. in front. These springs are of alloy steels and contain bushings in all the eyes. The spring bolt diameter is 1 in. and is lubricated by wick type oiling. The wheelbase is 135 in. and the length of the frame back of the cab is 115 in. The wheels are artillery type with fourteen spokes in both front and rear and carrying 34 by 3½ in. front, and 34 by 5 in. rear, tires, both solid. The weight of the chassis is approximately 3500 lb.

Bodies are furnished in six standard styles designed to suit any class of trade with a truck of this capacity. Standard equipment with the chassis includes driver's seat, front fenders and running boards, three oil lamps, tool kit and box, horn jack and odometer. Chassis and seat are painted in two coats of gray lead. The price is $1,595 without body, f. o. b. Defiance, Ohio.





Built-in tool box on Defiance truck, left, and Allen four-cylinder engine



Universal truck attachment made by Smith Motor Truck Corp.

SMITH MAKES UNIVERSAL UNIT

The Smith Motor Truck Corp. has brought out a universal Smith Form-A-Truck attachment of 1- and 2-ton capacity which is adaptable to practically every make of chassis except a Ford car, for which a standard attachment is made. The 1-ton attachment is recommended for all chassis with engines of less than 260-cu. in. capacity and the 2-ton for all of those having engines larger than this.

The frame is made from 4-in channel steel, reinforced by a cross member with heavy gusset plates. It is 13 ft. 6 in. long and when attached increases the wheelbase of the car 25 in. This length also provides a loading space of from 9 to 12 ft. back of the seat, depending upon the style of body and the design of car that is used.

The drive is through adjustable radius rods and not through the springs, which are slung under the dead rear axle. The jackshaft hanger is attached to the frame and to the housing of the passenger car rear axle, which incorporates in it a self-aligning bearing to absorb frame distortions. It is usually necessary to shorten the passenger car driving axle from 4 to 6 in., and the power is transmitted by three keys 120 deg. apart and fitting on tapered surfaces on the passenger car axle, thus making it possible to use any diameter of axle with the jackshaft attachment. The gear reduction is about 2 to 1 and the sprockets easily are removed, making it possible to change the gear ratio to suit variable conditions in a short time.

The brakes are 2 by 10 in. and located on the jackshaft, giving ample braking power. The entire attachment is designed so that it can be mounted on a passenger car chassis without mechanical difficulty. The 1-ton attachment sells for $400 and the 2-ton for $500.

LARGE ORDERS FOR WHEELS

Lansing, Mich., Jan. 11—The Prudden Wheel Co. and the Auto Wheel Co. have received a Government contract for $3,000,000 worth of wheels. These contracts must be completed by Dec. 31, 1918, and are proportional to the representative productive capacities of the two concerns. It is estimated that the Auto Wheel Co. will require 800 additional employees to complete the work in that time.

Other large orders have been placed with the Kelsey Wheel Co., Detroit, and the Hayes Wheel Co., Jackson, Mich.

OLDFIELD AND SWEET IN ARMY

George P. Sweet, general manager of the United Motors Co., has received the commission of captain in the aviation section of the Signal corps and is working on an order for 200 heavy-duty trucks for the Signal corps.

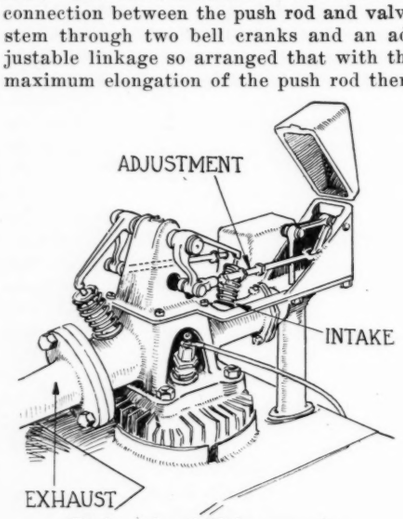
Lee Oldfield, motor car engineer and inventor of the Oldfield aero engine, has been commissioned a captain in the Signal Officers' Reserve Corps, the aviation section.

Above is the seven-passenger Holmes model, while at the right is shown the front of the new air-cooled car

Holmes Car Air-Cooled

THE new Holmes, an air-cooled car designed by Robert Holmes, formerly vice-president and chief engineer of the Franklin Automobile Co., and produced by the Holmes Automobile Co., Canton, Ohio, made its initial appearance at a private show held in New York last week. The Holmes company was organized about a year ago for the manufacture of this new car and it is expected that the production for the coming year will be about 4000 cars. The car has appeared with a seven-passenger touring body and also as a sedan and it is expected that a roadster will shortly be added to the line. It is understood that the price will range between $2,000 and $2,500.

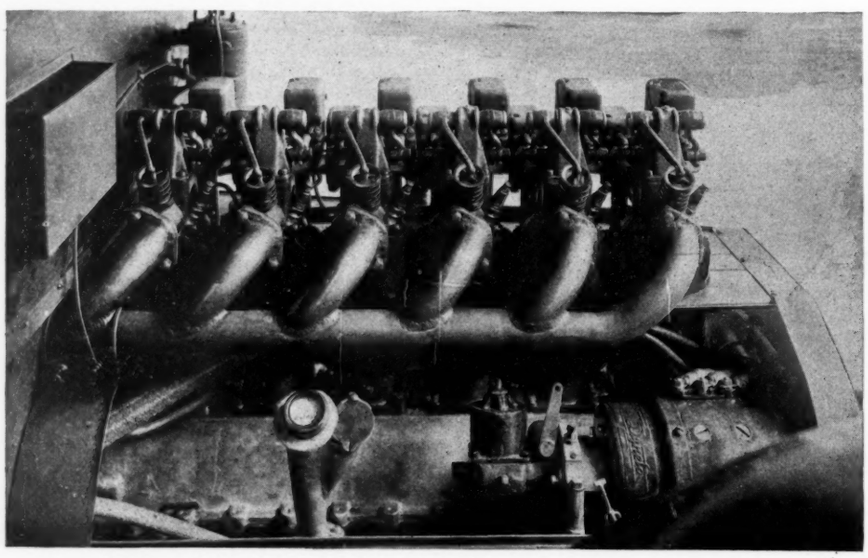
Cooling is accomplished by a method very similar to that of the Franklin, in which the air is induced around the separately-cast cylinders, which are vertically finned. The air jackets are interconnected instead of being individual as in the Franklin design. The cylinders have demountable heads of dome shape carrying inclined valves, which are operated by a patented valve gear designed to compensate more fully for elongation and contraction due to changes in the temperature of the push rods. The valve mechanism consists of a connection between the push rod and valve stem through two bell cranks and an adjustable linkage so arranged that with the maximum elongation of the push rod there is less than .001 in. variation in the clearance between the valve stem and the tappet.



Right side of Holmes engine

The shape of the cylinder head and the inclined angle at which the valves are set makes possible the use of rather large valves, especially the exhaust valves and more power is obtained by these means, which is an important factor with an air-cooled car. This construction also permits a minimum area in the combustion chamber, which tends to provide a cooler cylinder under operating conditions.

The engine is a six-cylinder 3½ by 4½ with pressure-feed lubrication by a gear pump to each main bearing and to the connecting rods through a drilled crankshaft. The air is induced into the engine by a Sirocco type of fan which is incorporated in the flywheel. Free air is drawn in through louvres in the side of the bonnet and is then led around all of the cylinder jackets instead of passing through a single jacket. By this it is possible to decrease the overall length of the engine and to have a shorter crankshaft than would be possible with individual cooling of the cylinders.



Exhaust side of the Holmes new air-cooled engine

FRANCE TO RECEIVE TRACTORS

Washington, Jan. 11—Fifteen hundred farm tractors will be sent to France by the Food Administration. All will be overseas for spring plowing in March. It is estimated that this increase in the French food supply, through greater efficiency, will release 2,000,000 tons of shipping in 1918 that otherwise would be needed to transport food. France in 1917 had 30,742,157 acres of crops, compared with 40,657,293 in 1913. The total food crop in 1917 was 24,581,290 tons as compared with 30,462,340 tons in 1913. The tractors will enable the French to plant 500,000 additional acres of potatoes and an extra million acres of wheat.

The plan for sending the tractors was conceived by Henry Morgenthau and his son, Henry Morgenthau, Jr., the latter of whom will supervise the delivery of the tractors in France and establish schools to train older men and women to use them.

Fulton Refines Trucks

Changes Powerplant and Transmission, Simplifies Operation of 1½-Ton

THE next season's 1½-ton Fulton truck has just been brought out by the Fulton Motor Truck Co., Farmingdale, L. I. This model will be known as F-X and is an amplification of the F-1 model delivered last year, with a change in the powerplant and transmission and numerous refinements to simplify operation.

The engine is the Herschell-Spillman. It is a larger and heavier engine throughout than has heretofore been used in Fulton trucks, is of L-head type with four cylinders, 3¼ by 5, and develops from 36 to 38 hp. under normal working conditions. The cylinders are cast in block and each piston has four rings. A much higher compression than before with variable spark and other engine refinements are the chief features.

The valves are larger than normally, and ignition is by Dixie magneto. A Carter carbureter is used, having but one adjustment acting on the air supply, and the engine is not governed. A speed of 25 m.p.h. is attainable, though the recommendation for the truck is but 15 miles, and operating speed is left to the judgment of the driver.

Greater Flexibility

Foot throttle and variable spark as against the set spark and throttle on the wheel used on the old model are provided for greater ease of operation, efficiency and flexibility.

The gearset is in unit with the powerplant and is a three-speed type, geared to the load at 8.2 to 1 in high speed. Driving is through Borg & Beck clutch.

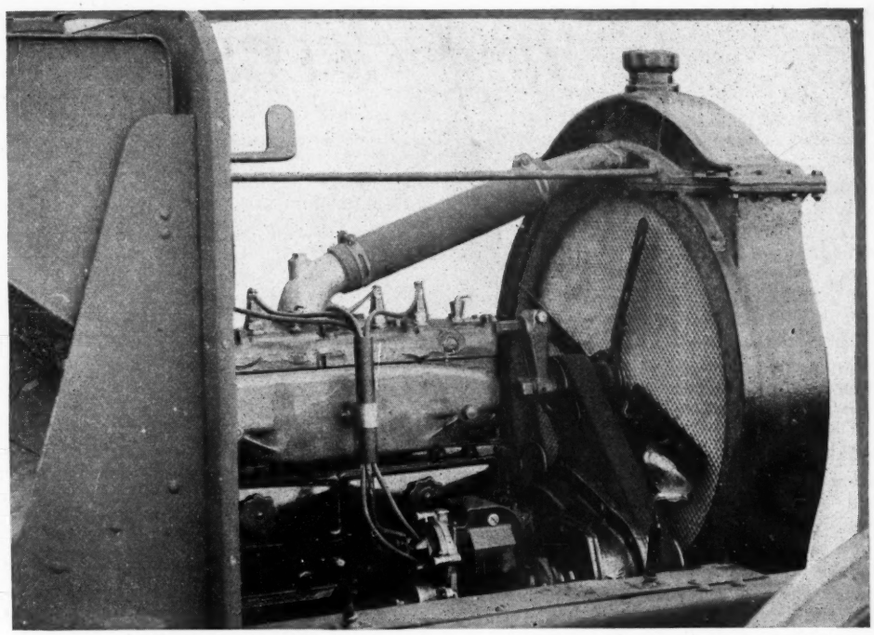
The rear axle is set well back under a load platform of 9 ft. measured from the rear of the cab to rear end of frame, permitting balance of the load where overhanging bodies for bulk carrying are advisable. The rear axle is a Russel internal-gear type, strengthened and heavier than that used on the model of last year. The load is carried on a dead rounded axle of chrome-vanadium steel. The jackshaft sets forward on the dead axle, which shortens the length of the driveshaft and adds sturdiness to that member. The front axle has been slightly enlarged and strengthened. The frame of the truck has had no changes since the first models were brought out and the Fulton radiator, rounded hood and tank on dash with gravity feed have not been changed.

The brake arrangement has been changed to bring the brake rods inside the frame and supply heavy equalizers, easily accessible, just behind the dead rear axle. This arrangement eliminates the necessity of frequent brake adjustments usual on trucks that are used for handling variable loads.

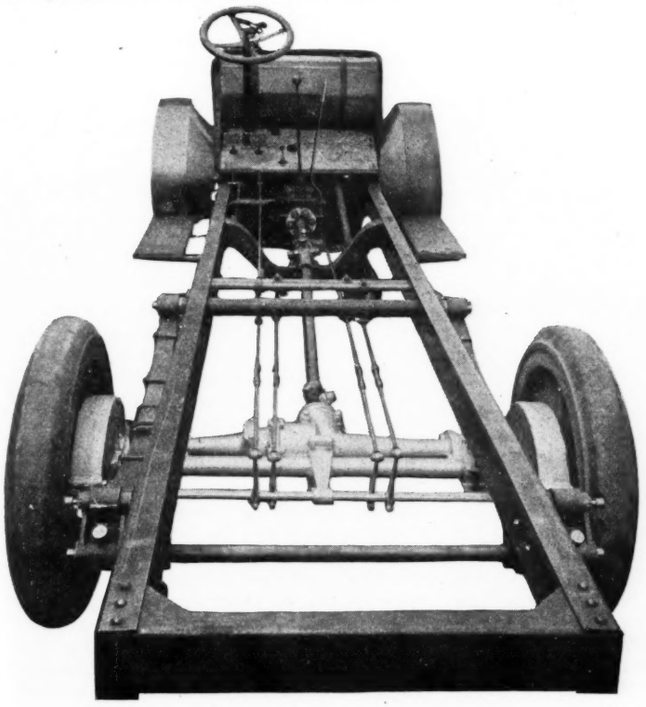
Springs now are supplied with eleven leaves instead of ten, and all leaves are made from heavier stock. Spring eyes are double wrapped, thus bringing two leaves over the forward rear spring pin to give ample surplus resistance to the thrust of the Hotchkiss type drive. This drive is through springs, and the frame is cleared of all torsion rods and struts.

A change to heat-treated malleable castings and drop forgings in numerous parts for greater toughness and strength; new hood fasteners, change in steering column assembly, a new radiator support, new starting crank bearing, grease cups instead of oil cups, lamp brackets on the dash, heavier fenders, castellated nuts and jam nuts on all bolts and other improvements are included in the new design.

Tire equipment is 34 by 3½ front and 34 by 5 rear, single, solid tires.



Engine, magneto, fan and rod assembly on Fulton. Note the round radiator



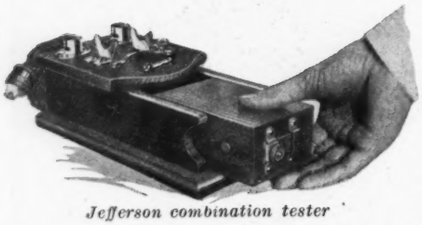
A view of the husky 1½-ton Fulton truck chassis, demonstrating its compactness and the clean lines of the design

AIRCRAFT INSPECTORS UNITE

Detroit, Jan. 11—The Detroit Aircraft Inspectors' Club, composed of the engineers who construct and inspect airplanes in this city, has been organized for more complete co-operation in the work of the members. Captain James Haeslett, who has charge of the Government aircraft equipment division in the city, and Captain Hotchkiss of the Washington division of aircraft equipment addressed the members. The officers elected follow: Lieutenant E. T. Jones, president; George Gray, vice-president; A. T. Davidson, secretary-treasurer. Monthly meetings are scheduled.

It is stated that the first of the Detroit-built war planes was demonstrated successfully last week.

The Accessory Corner



Jefferson combination tester

Electric Intake Heater

THE electric intake heater is a small electrically-operated heater attached to the outside of the intake pipe leading from the carbureter, forming a hot spot that aids vaporization and facilitates starting. The coil of the heater is wired to the storage battery through a switch mounted on the instrument board, and the switch is closed for a few moments before cranking the engine. By the resulting heat the intake pipe is heated through, so that when raw unvaporized gas comes in contact with the heated area, vaporization results. Price, $5.—Electric Intake Heater Co., 115 East Cortland street, Jackson, Mich.

Perpetual License Tag

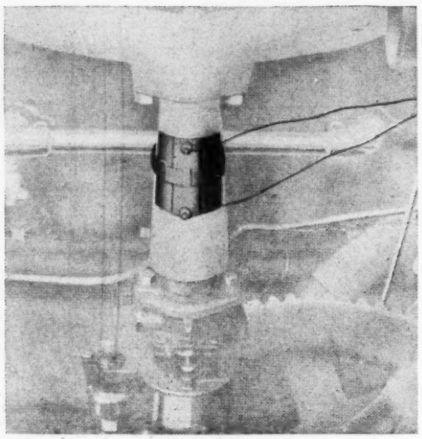
The primary object of the license plate described here is to provide a tag of which but a small and relatively inexpensive part, instead of the entire tag, requires changing each year to show payment of the current year's tax. The color of the year plate is changed each year. The inventor, who is a West Virginia resident, figures the saving to the state in postage as 7 cents on each renewed license as it costs 8 cents to mail the West Virginia license and the small yearly tag would cost only 1 cent.—P. F. Haberstick, Wheeling, W. Va.

Combination Ford Tester

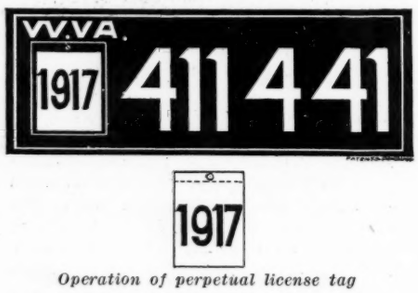
The Jefferson tester is a combination device applicable to lamp, plug, horn, Ford coil unit, etc. Various models are supplied, assembled in a highly polished mahogany case with all metal parts heavily nickeled. They are combination tester for alternating current, $6; combination tester for battery current, $8; combination tester for alternating current, $10; Ford unit and combination tester for alternating current, $8; and Ford unit and combination tester for battery current, $6.—Jefferson Electric Mfg. Co., 426-430 South Green street, Chicago.

Coil Ignition for Fords

The New York non-vibrating coil cannot suffer from welding or sticking because a mechanical finger forcibly separates the contacts at the completion of each sparking period. The circuit also is made in a positive mechanical manner so that failure of operation cannot occur. The coil ignition works equally as well on dry cells or storage batteries and provision is made for connecting the same. The system is installed by removing the present timer and replacing it with an elevating gear bracket upon the top of which is mounted a high-tension distributor. The present coil box together with all four units is discarded. A panel containing a two-point switch with removal keys occupies the position formerly taken by the coil box. Price, $20.—New York Coil Co., New York.



Electric intake heater



Operation of perpetual license tag

G E D Gasoline Economizer

The G E D Gasoline economizer and decarbonizer consists of a cylindrical tank partly filled with water, from the top of which a copper tube leads to the inlet manifold of the engine. There are two air inlets into the tank, one at the side, under or behind a baffle plate, and the other centrally in the top. When the engine produces a suction effect during the inlet stroke, air is drawn into the tank through both inlets, and that entering through the inlet at the side is forced to pass through the water around the lower edge of the baffle plate, so that it takes up all the moisture it will hold. This humidified air mixes with the dry air entering the tank on top and then passes into the manifold. The object in thus diluting the humidified air is to obviate the necessity for a pin hole in the tube leading to the manifold, which would be apt to clog. With the tube which has an outlet about ⅛ in. in diameter, there is no danger of clogging, but if the inlet on top of the tank is shut off all the air from the tank to the manifold must bubble up through the water and this gives too much moisture to the charge, it has been found. The advantages claimed for the G E D are that it prevents the formation of a carbon deposit on the combustion chamber walls and breaks up any such deposits that have formed, prevents knocking of the engine, insures smoother running and reduces the fuel consumption. The water capacity of the tank is about 31 oz. and this lasts about 150 miles on the average car. The tank is refilled through the central hole in the top.—Atlas Auto Specialties Corp., New York.

Lyon Bumper

The Lyon bumper is made in two sections of the highest grade oil-tempered spring steel. The sections overlap at the central portion of the bumper, giving adjustment and strengthening the impact member. It fits all cars without drilling or alteration of any kind. Price, from $8.75 to $12.50, according to make and size of the car.—Metal Stamping Co., Long Island City, N. Y.

Branford Carbureter

The makers of the Branford carbureters call special attention to the simplicity and compactness of their vertical type. All threads and drill holes are S.A.E. The gasoline enters the float chamber through finely screened mesh, going into the valve stem through the jet, and passes up through the hollow stem to the air valve, where it is sprayed through holes directly against the incoming air, always at the point of greatest velocity, insuring perfect vaporization at all times, it is claimed.—Holt-Wells Co., New York.

J & B Primer

The J & B primer operates by taking the gasoline from the gasoline line and delivering a rich mixture directly into the intake ports of the cylinders. To prime the ring in the radiator is given a short pull and let fly back. One pull should be sufficient, thought it is repeated if necessary. Installation requires the drilling of a hole in the manifold 1⅝ in. below the top with an $\frac{11}{32}$ drill and tapping the hole with a ⅛ in. pipe tap. The hole is shellacked and the T of the injector inserted and screwed tight. Three-way connection is substituted after removing elbow from carbureter. Price, $3.50.—J & B Mfg. Co., Pittsfield, Mass.

AMBU Battery Steamer

The Peers AMBU battery steamer is a device for softening the sealing compound on starting and lighting batteries by steam so that the battery can be opened easily and without a gas flame or blow torch. It consists of a steam generator, steaming box and water supply tank. The battery can be opened with it in 5 min. after steaming for 15 min., it is claimed. The supply tank is of galvanized iron and connected to the generator by a small hose. It is a foot or more higher than the generator so the water flows by gravity. The steaming box is a stout wooden box, and steam is introduced through the cover by a hose from the generator.—American Bureau of Engineering, 1018 Wabash avenue, Chicago.

Gabriel Windshield Cleaner

A new and improved type of the Gabriel windshield cleaner permits its attachment on shields of open or closed cars without cutting into or otherwise marring either frame or shield or glass. It is attached by simply clamping on frame. The type of top which extends down over frame of shield does not interfere with the device.

The arm of the cleaner is operated by a pull on a cord which is within convenient reach of the driver. When the cord is released the cleaner arm returns automatically to a position along the upper section of the frame and out of the line of sight.—Gabriel Mfg. Co., Cleveland, Ohio.

Spery Radiator

The Spery radiator combines the tubular and honeycomb construction, the tubes being pressed into the water wall. This gives a wide surface for the water to spread over and presents a surface sufficiently irregular to retard the flow of the water so as to give it the maximum time in which to cool. The entire space of the water wall on both sides is exposed to the air. While the radiator is exceptionally light, it is rigid and strong with points of contact between the different parts unusually wide. The radiators are undergoing tests at forty-five motor car plants and at the Bureau of Standards in Washington. It is adaptable to tractors and trucks also.—Hooven Sales Corp., Chicago.

Smith Safety Signal—The Smith signal consists of a box-like device attached to the rear of the car or truck in such a way that it is visible from either direction. It is operated electrically from a switch on the steering wheel. Standard color is black, though options are given in finish. Control is from a plainly marked switch on or accessible to the steering wheel. Price, $17.50.—Smith Signal Corp., 53-55 West Sixty-sixth street, New York.

Munger Piston Regrooving Tool

The Munger regrooving tool is provided with an adjusting screw to adapt it to different size cylinders and is used to true up the groove to the ring and especially adapted for use with the Munger Always-Tight piston ring. Its distinct feature is that with its use it is not necessary to disconnect the piston from the connecting rod. It is said that its work is as exact as that of a lathe.—Splitdorf Electrical Co., Newark, N. J.

Williams Tube Deflator

The Williams improved tube deflator is for repair shop use. With it the tube is slipped over one of the projections on a plate; then by turning the handle the tube is wound tightly around the two projections and the air exhausted at once. The device handles any size of tube.—Williams Foundry & Machine Co., Akron, Ohio.

Tell-Tale Piston Ring

The Tell-Tale piston ring is an individually cast, single-piece ring with a patented feature that consists of a channel and vents on its wearing surface which provide for the reception and distribution of the oil supplied to the cylinder walls. It is self-oiling.—Vulcan Machine & Tool Co., St. Louis, Mo.

New Apco Products

Two new Ford accessories have been added to the Apco products, a brake adjuster and a timer. The adjusters are driven over the cams when the brake shoes are worn, and when new shoes are installed they may be removed and used again. The adjusters are of high-grade steel and last indefinitely. The timer has clock springs; a roller of high-grade hardened steel, running on a hardened steel bushing held in a die casting; a shell of heavy drawn steel, and insulation of finest quality bone fiber. New sets of springs can be obtained at 20 cents a set and can be put in place on the road if necessary. The roller also can be replaced, for 30 cents. Prices, brake adjuster, 25 cents; timer, $1.—Apco Mfg. Co., Providence, R. I.

TO MARKET MERCURY CAR

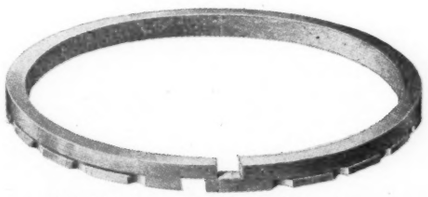
New York, Jan. 11—Mercury Cars Inc., which recently was formed in New York, is preparing to place on the market a four-cylinder car powered with a Weidely 3½ by 5½ engine to sell for from $2,750 to $2,950 in open models and from $3,600 to $3,900 in closed models. The company has established a factory of limited size at Hollis, L. I., and plans to enlarge this considerably prior to the time active production of cars is commenced, which probably will be midsummer of this year. The car, the first of which was on view at the Astor salon, is very simple in construction and has been designed to require the minimum of care. It will have a wheelbase of 114 in.

Cowles Window Lift

The Cowles window lift is installed on the filler board of the door as a unit, and is operated by a small nickeled crank and so constructed that the glass locks itself automatically every half inch both in raising and lowering. The automatic lock only operates when the hand is removed from the crank.—C. Cowles & Co., New Haven, Conn.

A. W. Convertible Top

Glass panels bounded by metal strips, together with a standard A-W summer top constitute the A-W convertible top which makes it possible to change a touring car into an inclosed model for cold weather. This model is made for all makes of cars and the detachable windows are held in place by patent clamps, the panels above the doors being designed to swing open when the doors are opened.—Adams-Williams Mfg. Corp., New York.



Construction of Tell-Tale piston ring

No-Freeze Solution

No-Freeze solution is put up in 6-lb. packages for cars of 3½ gal. capacity, such as Fords. One package is used for zero weather; two packages for 20 deg. below. For cars not over 5½ gal., such as Dodge Brothers, Studebaker, Hudson, etc., one package is enough for 5 above zero and two for 10 below. These packages suffice for 20 deg. below zero. No-Freeze has a boiling point of 235 deg. and is said not to injure rubber, cloth, packing, metal, etc. As the water in the radiator evaporates, it is only necessary to refill with pure water. To use it the contents of the package are emptied in 2 gal. of water and dissolved in the latter. This solution is then placed in the radiator and the system filled up with clear water. If the water contains alkali or appears hard it is essential to procure rain or snow water. No-Freeze solution is drained out in the spring. The makers do not recommend it for use in the Knight engine. Stearns & White Co., 859 North Franklin street, Chicago.

New Curtis Pump Unloader

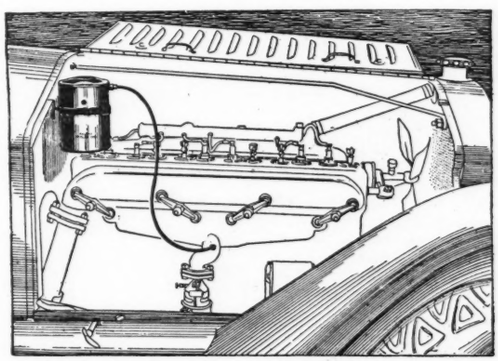
A new type of mechanical unloader for starting duty has been fitted to the Curiss air compressors. This is a safety valve which automatically is put into use when the motor is started so that the engine will not top against 100 per cent pressure. As the speed increases the valve is gradually shut off. Formerly the unloading was accomplished by a hand device.—Curtis Pneumatic Machinery Co., St. Louis, Mo.

Saferlite Lens

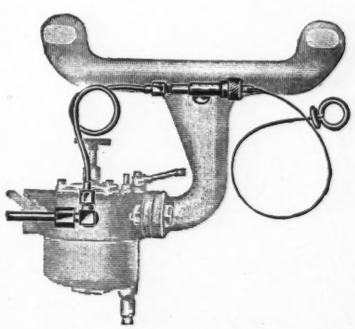
The new Saferlite deflecting lens uses a horizontal prism on the upper half of the head lamp and vertical prisms on the lower half. The front glass is 9¼ in. long. —Electrical Testing Laboratories, New York.

Au-To Air Compressor

A smaller model air compressor has been added to the Au-To line which is of the same general construction as the other models except for the difference in size, the motor having a 2-in. bore by a 2½-in. stroke and a 12-in. flywheel. The overhaul height is 16 in., the maximum pressure 200 lb. and the weight about 50 lb. Price, $50.—Au-To Compressor Co., Bloomington, Ohio.



G. E. D. gasoline economizer and decarbonizer



J. & B. primer

Among the Makers and Dealers

FROM DETROIT TO CHICAGO OVERLAND—Just before Christmas, when freight congestion was at its worst, this train of fifty trucks with as many cars on board made the trip from Detroit under the direction of Ray McNamara, Maxwell road engineer, to Harry Newman, the Chicago representative of Maxwell. The overland truck train released thirty freight cars for other transportation. Trucks and cars arrived in perfect condition

SERVICE Truck Adds to Plant—The Service Motor Truck Co., Wabash, Ind., which recently obtained a Government contract for the manufacture of trucks, has awarded a contract for the construction of two large additions to its plant. One of the buildings to be erected will be 75 by 200 ft., and the other 50 by 400 ft.

Haskelite May Use United Truck Building—The Haskelite Co., Grand Rapids, Mich., which manufactures veneer parts for airplanes, is starting work on its new plant. Pending its completion, one of the new buildings of the United Motor Truck Co. probably will be used for experimental work in the making of airplane bodies.

Danner Heads Pan-American—Edward Danner was elected president of the Pan-American Motors Corp., Decatur, Ill., at a meeting of the board of directors, succeeding A. H. Wyatt, who was chosen as executive a week previously, but who later resigned. It has been decided to dispose of the plant at Louisville, Ky., of the Sun Motor Co., recently absorbed by the Pan-American.

Nashville Dealers on Cash Basis—The Nashville Automobile Dealers' Trade Association has adopted the cash basis in an endeavor to make business conditions better and permit it to be carried on with present capitalization. The dealers first considered the advisability of raising the prices in their shops and garages and of changing their organization in various ways. They found that their expenses were greater than ever before and that their present capital was being worked to the limit, adding capital would only serve to make their expenses more. Hence, the decision to do business only on a cash basis.

Coleman Gets New Selden Job—J. R. Coleman, who has been chief engineer and assistant general manager of the Atterbury Motor Car Co., Buffalo, N. Y., has become factory manager in charge of production and purchasing for the Selden Motor Vehicle Co., Rochester, N. Y.

Dorris Heads Dorris Company—George P. Dorris, designer of the Dorris car, has been elected president of the Dorris Motor Car Co. to succeed W. R. Colcord. Mr. Colcord was made president several months ago when H. P. Krenning sold his interest in the company. Webster M. Colburn, former secretary, but recently not connected with the company, was made general manager.

Willys-Overland Awards Prizes—A few weeks ago Willys-Overland, Inc., offered a prize for the most effective and artistic combination of car and top design. Students in the New York School of Fine and Applied Arts, the New York School of Applied Design for Women; Church schol of Arts, Chicago; Pennsylvania School of Industrial Arts, Philadelphia, and the Art Institute, Chicago, entered the contest. Mary R. Cornwell, the New York School of Fine and Applied Arts, won the first prize, and Geraldine Eggers, the Church School of Arts, second prize. Anna G. Gallagher, School of Industrial Arts, was third.

Kanary Succeeds Sweet with U. M.—M. H. Kanary has been made general manager of the United Motors Truck Co., succeeding George P. Sweet, who recently resigned to accept a commission as lieutenant in the motor truck division, aviation section of the Signal Corps. Mr. Kanary is president and general manager of the Samson Trailer Corp., and also president of the Chicago Structural Steel Co.

Youngstown Dealers on Cash Basis—Members of the Youngstown Automobile Dealers' Association have put their business on a strictly cash basis beginning Jan. 1. The cash basis will cover repair charges as well as sales and will extend not only to individual customers but also to large corporations. The Youngstown Automobile Dealers' Association represents 60 per cent of the retail business of the city.

Gillette Tire Adds to Plant—Though less than a year old, the Gillette Tire Co., Eau Claire, Wis., already is contemplating the two-fold enlargement of its tire and rubber plant by the erection of two additional stories on the present one-story main factory. To provide immediate warehousing and shipping

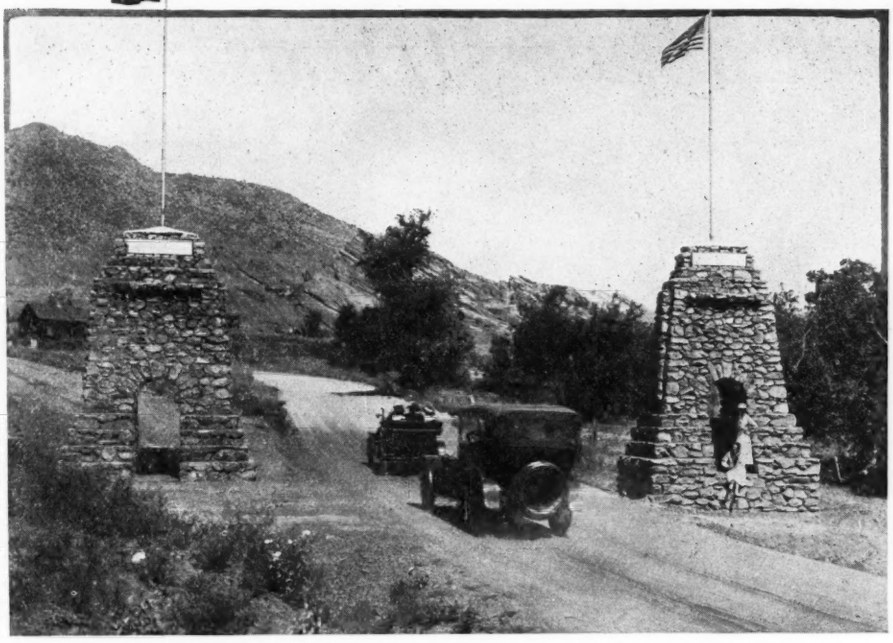
Coming Motor Events

MEETINGS

Feb. 1—Chicago, S. A. E., War dinner at Hotel Horrison.

SHOWS

Jan. 9-27—Cleveland, Ohio.
Jan. 11-18—Washington, D. C.
Jan. 11-19—Providence, R. I.
Jan. 12-19—Philadelphia, Pa.
Jan. 14-19—Rochester, N. Y.
Jan. 16-25—Milwaukee, Wis.
Jan. 19-26—Montreal, Canada.
Jan. 19-26—Detroit.
Jan. 19-27—Cleveland, Ohio.
Jan. 21-26—Scranton, Pa.
Jan. 21-26—York, Pa.
Jan. 21-26—Buffalo, N. Y.
Jan. 21-26—Wilmington, Del.
Jan. 22-26—Oklahoma City, Okla.
Jan. 22-26—Baltimore, Md.
Jan. 26-Feb. 2—Chicago.
Jan. 26-Feb. 2—Harrisburg, Pa.
Jan. 26-Feb. 2—Columbus, Ohio.
Feb. 2-9—Minneapolis, Minn.
Feb. 5-9—Binghamton, N. Y.
Feb. 7-13—Portland, Ore.
Feb. 11-16—Kansas City, Mo.
Feb. 11-16—St. Louis, Mo.
Feb. 11-17—Toledo, Ohio.
Feb. 16-24—San Francisco, Cal.
Feb. 18-23—Syracuse, N. Y.
Feb. 18-23—Grand Rapids, Mich.
Feb. 18-23—Springfield, Ohio.
Feb. 18-23—Des Moines, Iowa.
Feb. 18-23—Duluth, Minn.
Feb. 18-23—Nashville, Tenn.
Feb. 18-25—Pittsfield, Mass.
Feb. 18-27—South Bethlehem, Pa.
Feb. 20-23—Quincy, Ill.
Feb. 20-23—Des Moines, Iowa.
Feb. 25-March 2—Salt Lake City, Utah.
Feb. 25-March 2—Muskegon, Mich.
Feb. 26-March 2—Omaha, Neb.
March 2-9—Boston, Mass.
March 6-9—Clinton, Iowa.
March 6-9—St. Joseph, Mo.
March 6-9—Sioux Falls, S. D.
March 16-20—Great Falls, Mont.
March 20-23—Trenton, N. J.
April 9-13—Stockton, Cal.



DEALER DONATES GATEWAY TO DENVER—This is the $2,000 patriotic gateway presented to the Denver system of mountain parks by Finlay L. MacFarland, veteran dealer and good roads worker, president of the Buick agency. It is at the foot of Lookout Mountain, and is made of mountain rocks

facilities, the Gillette company will build a three-story concrete and brick addition 66 by 100 ft. A new power and boiler house also is being completed. The equipment is being enlarged by the installation of two large tire-making machines and a calendar with 66-in. rolls.

Larrabee-Deyo Elects Officers—The annual meeting of the Larrabee-Deyo Truck Co., Binghamton, N. Y., was held Dec. 31. R. H. Deyo, vice-president and general manager, reported an increase in business of 210 per cent, and an increasing demand for Larrabee trucks for the dealer requirements for 1918. The officers were re-elected. A new 5-ton model will be brought out.

Engineering & Sales Gets New Accounts—The Engineering & Sales Corp., Chicago, has taken over engineering and supervision of purchases for the Oklahoma Mfg. Co., Muskogee, Okla., maker of 1-, 1½- and 2½-ton trucks. The Mutual Truck Co., Sullivan, Ind., maker of 1½-, 2½- and 3½-ton trucks, also has placed its engineering work and supervision of purchases with the Engineering & Sales Corp.

Kelly-Springfield Adds Branch—The Kelly-Springfield Tire & Rubber Co., New York, has established a branch at Milwaukee, Wis., with J. A. Glaspy as manager. A branch office also will be maintained at Madison, Wis.

To Market Wisconsin Tractor Output—The Wisconsin Farm Tractor Co., Sauk City, Wis., has concluded arrangements with the Brewer-Mosel Automobile Co., Madison, Wis., to market its entire output for 1918, giving it exclusive representation of the Wisconsin line in the United States and foreign countries. The Wisconsin company was organized two years ago by Earl McFarland and John Westmont, Lodi, Wis., to manufacture an all-steel tractor. A short time ago the business was incorporated under its present name with an authorized capital stock of $100,000, and arrangements made for a greatly increased output. The Brewer-Mosel company is a district distributer of the Maxwell in ten southwestern Wisconsin counties.

Schwerdtseger with Air-O-Flex—F. W. Schwerdtseger has been appointed designing engineer of the Air-O-Flex Automobile Corp. Mr. Schwerdtseger has been with the United States Motor Denby Motor Truck Co.

Tennants Enter Securities Business—W. G. and J. G. Tennant have entered the motor securities business and will operate as the Tennant Motor, Limited, the name formerly used in the retail motor car field. The new organization will specialize in financing retail car sales, cars in winter storage and dealers. W. G. Tennant is president; J. G. Tennant, treasurer, and K. E. Potter, secretary.

Rex Ignition Holds Convention—Twenty-three division managers from the Central West, the South and the East attended the annual sales convention of the Rex Ignition Mfg. Co. Hugo Kirschbaum, president, was chairman of the conference, which was held during the New York show. The Rex company will hold a similar convention at its Chicago branch office Jan. 15, at which time the branch managers from the Pacific Coast and the Southwest will be the conferees.

Wallis and Case Hold Convention.—A special convention of branch managers of the Wallis Tractor Co. and J. I. Case Plow Co., Racine, Wis., was held recently. Although the time of holding a conference was rather unusual, it was arranged to discuss the problems created by the present unprecedented conditions in the industry. H. M. Wallis, president of the companies, who recently returned from a foreign trip lasting thirteen months, presented a thorough review of conditions in Europe, based on exhaustive personal observation and analysis.

Reliance Prepares for New Plant—Contracts were awarded last week for the erection of the new Appleton plant of the Reliance Motor Truck Co., which is changing its location from Racine, Wis., to Appleton. The first unit will provide about 22,500 sq. ft. of floor space and cost $50,000. The building will be ready for occupancy about April 1, at which time the equipment and machinery of the present plant in Racine will be moved. Much new equipment is being purchased for delivery early in April. The Reliance commercial car will be in regular production at Appleton about May 15.

Recent Incorporations

Canton, Ohio—Edison Electric Co.; capital stock, $10,000; incorporators, Guy L. Tudor and H. D. Slagle.

Cleveland, Ohio—Northern Ohio Motor Transportation Co.; capital stock, $10,000; incorporators, Harvey O. Yoder and Monta M. Rich.

Chicago—Ogden Motor Supply Co.; capital stock, $100,000; incorporators, Frank Posvic, Otto Ring and James Pavlisek.

Chicago—Empire Auto Sheet Metal Works; capital stock, $10,000; incorporators, Howard F. Leopold, Sidney Adler and R. Aronson.

Chicago—Fort Wayne Tire & Rubber Mfg. Co.; capital stock, $500,000; to manufacture motor car tires and rubber products; incorporators, L. E. Kraft, J. C. Brown and H. J. Karr.

Detroit—Pronvost Wheel Co.; capital stock, $40,000; incorporators, Joseph Pronvost, Floyd Warner and J. W. Biddle.

Detroit—F. F. Wood Motor Co.; capital stock, $5000; incorporators, W. L. Marsh, F. W. Todd and F. F. Wood.

Detroit—Holley Kerosene Carbureter Co.; capital stock, $100,000; to manufacture carbureters; incorporators, George M. Holley, Earl Holley and M. A. Cryderman.

Detroit—Automatic Screw Machine Co.; capital stock, $25,000; incorporators, J. H. Mailhot, B. I. Mailhot and E. L. Olney.

Detroit—Locke Pattern Works; capital stock, $15,000; incorporators, D. H. Locke, Mary R. Locke and T. E. H. Black.

Franklin, Ohio—Franklin Auto Shop; capital stock, $10,000; incorporators, A. J. Conover, Vera Cook, C. T. Hendrickson, L. W. Winters and Nevin E. Veneman.

Frankfort, Ind.—Frankfort Carbureter Co.; capital stock, $250,000; to manufacture carbureters; incorporators, Milton T. McCarty, Richard D. Voorhees, William H. Frank, Frank E. Coulter, Carl W. Sims, William H. Spencer and Eugene O. Burget.

Hamilton, Ohio—Liberty Machine Tool Co.; capital stock, $100,000; incorporators, F. K. Vaughn and A. Ballinger.

Hamilton, Ohio—Vail-Lentschler Farm Tractor Co.; capital stock, $500,000; to manufacture farm tractors; incorporators, William J. Devanney, Thomas L. F. Morgan, A. Munnion, M. E. Ostendorf and Joseph Lemkuhl.

Huntington, Pa.—McKinley Storage Battery Co.; capital stock, $5,000; to operate service battery stations; incorporators, T. J. McKinley, W. R. Power, C. W. Marcum, J. O. Marcum and H. S. Newton.

Joplin, Mo.—Bell Motor Co.; capital stock, $20,000; incorporators, W. J. Bell, Mrs. Della Bell and Lois St. Louis.

Kansas City, Mo.—Massey Motor Co.; capital stock, $18,000; incorporators, H. E. Massey, R. N. Taylor, S. G. Massey and Elsie W. Massey.

Lima, Ohio—Lima Auto Clearance Co.; capital stock, $10,000; to deal in new and second-hand motor cars; incorporators, H. K. Heineger, H. H. Heineger, C. W. Counsellor, F. R. Fangle and Cloyd J. Brotherton.

Los Angeles, Cal.—Oldfield Tire Co.; capital stock, $50,000; to manufacture motor car tires; incorporators, Barney Oldfield, R. R. Colby and Frank L. Chance.

Los Angeles, Cal.—Crawford & Saunders Aircraft Co.; capital stock, $200,000; to manufacture airplanes; incorporators, Leslie R. Saunders, Harry J. Crawford and John G. Harrah.

Macon, Ga.—H. J. Lamar Co.; capital stock, $25,000; to manufacture and sell motor cars; incorporators, H. J. Lamar, F. A. Goss and J. L. Evans.

Maysville, Ohio—Maysville Central Garage Co.; capital stock, $10,000; incorporators, O. L. Bartlett, Henry R. Wood and W. H. Strode.

New York—New York Rotary Motor Co.; capital stock, $1,700,000; to manufacture motors, etc.; incorporators, A. M. Sullivan, H. and S. S. Meyers.

Quincy, Fla.—Shaw Auto Co.; capital stock, $25,000; incorporators, C. E. Shaw and W. B. Malone.

Savannah, Ga.—H. J. Lamar Co.; capital stock, $25,000; to manufacture and sell motor cars; incorporators, H. J. Lamar, F. A. Goss and J. L. Evans.

St. Petersburg, Fla.—Boardman, Vogel & McRae; capital stock, $15,000; to conduct a general motor car and garage business; incorporators, Paul R. Boardman, George R. McRae.

Savannah, Ga.—Holcomb-Williams-Blitch Motor Co.; capital stock, $20,000; incorporators, J. H. Holcomb, L. B. Williams, J. G. Blitch and H. P. Jones.

Syracuse, N. Y.—Wilson & Greene Motor Co., Inc.; capital stock, $50,000; to manufacture motor cars; incorporators, G. M. Wilson, O. H. Greene and L. Will.

Toledo, Ohio—Union Express & Truck Co.; capital stock, $10,000; incorporators, John C. McFellin and M. H. McFellin.

Warren, Ohio—Trumbull Republic Motor Co.; capital stock, $10,000; incorporators, W. M. Kastriner and Ben Feniger.

From the Four Winds

CAMP CUSTER HAS OWN CEMENT ROAD—About the first thing the builders of Camp Custer, Mich., did was to construct this cement road extending the full length of the camp, or 3 miles. The road has several branches and others are to be built. Battle Creek constructed a 4-mile cement road to the camp and will build another this spring. Motor traffic alone is allowed on the 4-mile road and within the camp are restrictions also

MINNESOTA Paves Jefferson Highway—Paving of Jefferson highway as far south from St. Paul, Minn., as Westcott has been arranged. Dakota county will give $30,000 from South St. Paul down, the state $35,000 and the Government $34,000. Previously arrangements had been made to pave 6 miles south of the city to the line at a cost of $35,000 to Ramsey county. The road will be concrete, 20 ft. wide.

St. Louis Gets Show Building—The St. Louis show will be held Feb. 18-23 in the building that was the Southern Hotel, known to all traveling men who visited this city up to six years ago. Owing to the construction of the building only two floors can be used. These will provide ample space for passenger car and accessory exhibits, but for the first time in St. Louis space will not be alloted to trucks. The building covers an entire block, and nearby streets provide ample parking space for an almost unlimited number of cars.

Sixty Miles in Two Days—The tire-testing fleet of the B. F. Goodrich Rubber Co. is having its own troubles. Ever since leaving Ohio the pilots of the fifteen cars have been busy digging paths for their cars. After leaving Cincinnati it took them two days to make 60 miles. On one occasion they shoveled snow for 10 hr. and made 6 miles. The cruise will take the fleet over about 150,000 miles during the next three months. Every town and city along the line of travel will be given road information and tire instruction.

Ohio Roads Built in 1917—Contracts for 249.6 miles of roads in Ohio were let last year. They were: Plain concrete, 15.97 miles; reinforced concrete, 11.92; water-bound macadam, 90.12; bituminous macadam, 69.34; surface-treated macadam, 3.77; brick, 45.49; roadbed and roadway only, 12.98. This is described as an increase of 62 per cent over the previous year, despite the hindrances of an unfavorable spring on contract work. Altogether 1034.23 miles were repaired, and there is now a total of 1468.31 miles of state roads.

Minnesota May Register 225,000 in 1918—At the rate of probable gain in the registration of motor cars for the three-year period just ended of 191,000, the total for 1918-1920 is expected by the secretary of state to reach 225,000. The gain for the last triennial was 54,000 cars. With the new total the revenue for the highway fund this year will be $1,125,000. The license fee now is $5 for three years, as against $1.50 before. Motorcycles, which will pay $5, number 11,000, and no increase is expected. New licenses are issued at a limit of about 3000 a day, so that for a time, until the rush is over, prosecution is not expected for cars carrying 1915-1917 tags. To date about 90,000 licenses have been issued.

The Motorists' Bookman

"Modern Gasoline Automobile"

The 1918 edition of "The Modern Gasoline Automobile" by Victor W. Page is a revised and enlarged edition and covers various forms of war motors and recent developments in motor truck design as well as passenger cars. The chapter on starting and lighting systems has been enlarged and new forms of change-speed gears, final power transmission systems and chassis improvements are illustrated and described. The book as revised is nearly twice its original size, when it was first published six years ago. It contains 1000 illustrations, with thirteen folding plates. Altogether it is a complete and concise treatise on the design, construction, operation and maintenance of the motor car.

"Argentine Market"

Under the title "Argentine Markets for Motor Vehicles," a Government report, Miscellaneous Series No. 62, David Beecroft, directing editor of the Class Journal Co., presents the possibilities of selling American motor vehicles in Argentina. Mr. Beecroft discusses the factors that affect the motor vehicle trade, the import of motor cars, trucks, tractors, accessories and sales methods. Copies can be obtained at the nominal price of 5 cents from the Superintendent of Documents, Washington, D. C., or from any district office of the Bureau of Foreign and Domestic Commerce.

Illinois Licenses Total 340,291—Illinois issued 340,291 motor car licenses in 1917, as compared with 248,429 in 1916. Motorcycle licenses numbered 13,740, against 14,931 in the preceding year. Chauffeur licenses aggregated 43,679, as compared with 33,022 in 1916. Dealers' licenses were 3745, against 2871 in the previous year. In 1911, when the motor car license law took effect, but 38,629 permits were issued.

Hartford Allots Its Show Space—Practically all space for the annual Hartford show has been allotted by the Hartford Automobile Dealers' Association, Inc. This year the show will be held Feb. 16-23. The main floor will be devoted to passenger cars and accessories and the basement to trucks. The truck section this year will be nearly as large as the passenger car section. Present indications point to a much larger and better exhibition than ever before.

Car School for Hartford Police—In order that Hartford, Conn., policemen may become the more efficient in the recovery of stolen motor cars, a school of instruction has been established and before long Hartford's guardians will be able to call the various cars by their first name. Major features of construction to which especial attention is called in the school are the front axle, lamps, hood and fender conformation, type of cooler and rear axle housing. The Hartford Automobile Dealers' Association is making every effort to assist the police in making their school effective.

Fire Visits Rhode Island Dealers—Two big garage fires in one day with a loss of nearly $130,000, and about fifty motor vehicles was the New Year's gift to the motor colony of Rhode Island. The larger of the two fires was in the big Packard service station and caused about $120,000 loss. Thirty-five touring cars, seven trucks and $30,000 worth of accessories, parts, etc., burned. The motor vehicles were valued at $70,000, and the loss to the building, which will have to be entirely rebuilt, was about $20,000. The second fire occurred in a garage with five cars in it.